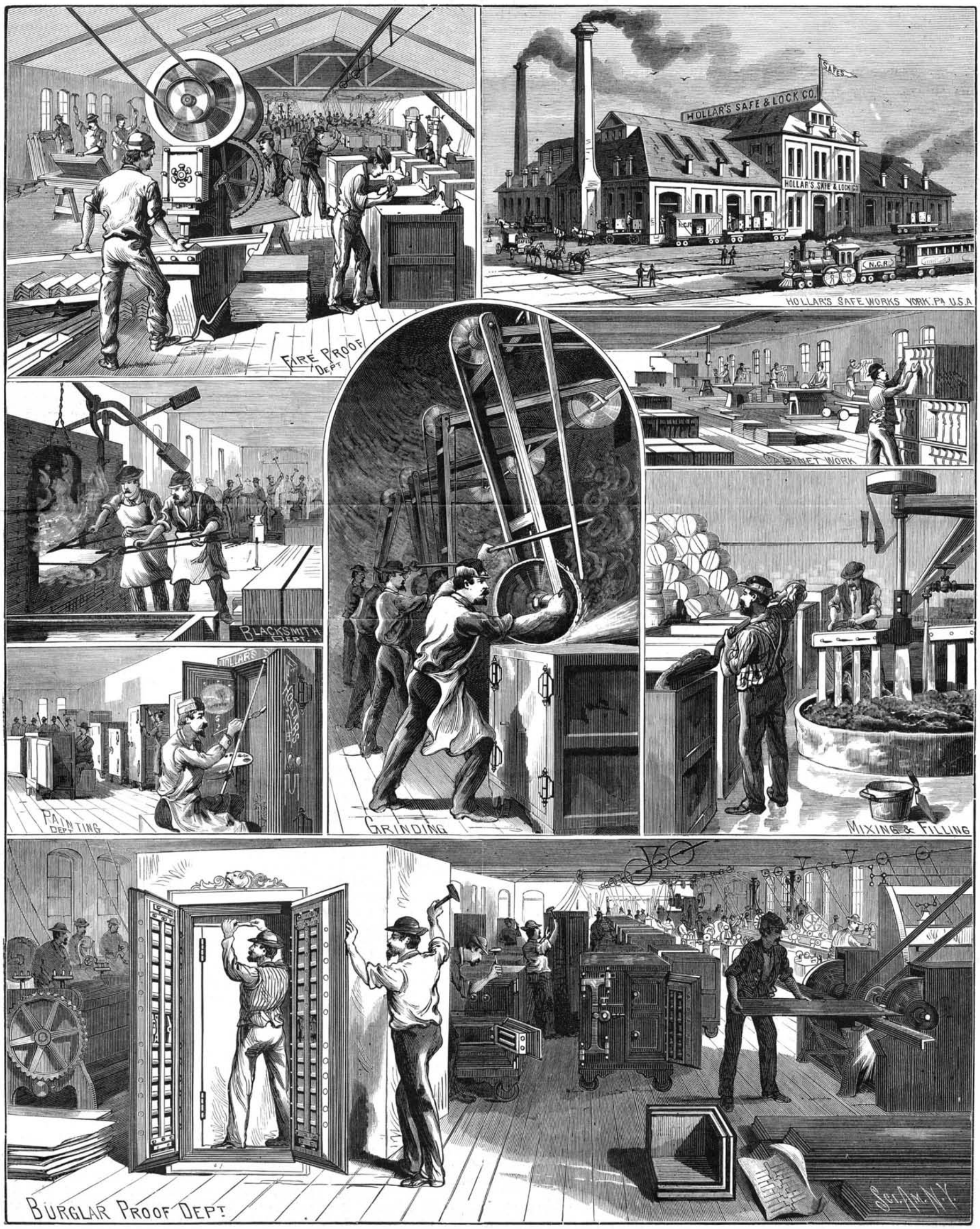
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLVIII.—No. 23. [NEW SERIES.] NEW YORK, JUNE 9, 1883. [$3.20 per Annum. [POSTAGE PREPAID.]



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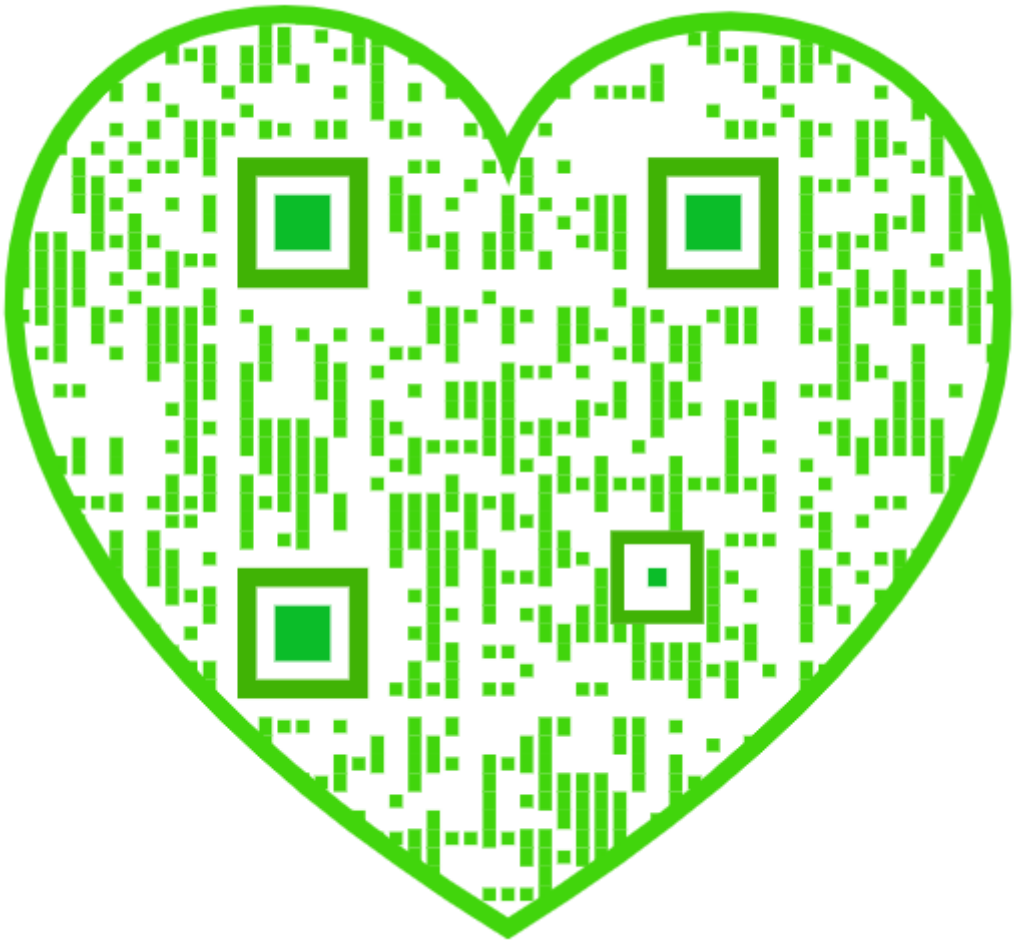

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, JUNE 9, 1883.

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DROP FORGING OF TOOL STEEL.

In the ordinary forging of iron the element of time is an important factor—the material is gradually and by successive blows brought into shape, the anvil work being supplemented by successive reheatings. In drop forging, although the final result is the same, the operations, which in common forging require time, are compressed into an instant, a single blow, or at most two or three, serving instead of the long continued hammering of ordinary anvil work. It is evident, however, that all the changes in the iron that are brought about by the gradual coaxings of the hand hammer must take place under the drop, only the changes are nearly instantaneous. To effect these changes so suddenly the iron must be rendered very pliant and plastic by high heating, approaching that of the welding process. For this reason it has not, until recently, been believed that cast steel—tool steel requiring the retention of all its qualities of being hardened and receiving temper—could be successfully worked under the drop hammer. But this is now done as readily as the working of the toughest and softest of Swedish iron. By means of adjustable drops, which allow of blows from varying heights, the steel may be wrought precisely as though under the hand and trip hammer, without injury to it from overheating.

Cast steel partakes, undoubtedly, of that quality of iron known as "flowing;" that is, the metal may be pressed into forms without destroying or impairing the continuity of its fibers, merely changing their direction to conform to the outlines of the new shape. Usually this "flowing" of the metal is produced by compression—quick compression, but not a sudden blow—the metal, while plastic from heat, being forced into a mould or die. But the steel can be worked in a similar manner under a drop. Lathe-turning tools, planer tools, caliper gauges, and many other small implements requiring hardening and tempering are now made from tool steel by being struck up in dies under the drop-hammer.

Drying Rooms.

The rapid increase in mechanical processes and the demands of growing trade cause annual additions to the number and size of drying rooms in use. Manufacturers, too, say that the surveyors of companies are becoming more critical, and a few years ago made no objection to furnaces, and even to red-hot flue-pipes, but now the seemingly innocent steam-pipe is overhauled, and disparaging remarks are made about its position and its relation to wood or material. It is doubtless true, says the *Insurance World*, that the surveyors and special agents have been educated at the expense of the companies, as shown by the loss-books in the fire hazards of arrangements formerly supposed to be entirely safe. Meantime the drying rooms are becoming drier every year, the wood in their construction is becoming more like tinder, and the factors necessary for a fire are being multiplied. Even brick and iron are not always as innocent as they seem, for one retains heat for a long time and the other conducts it to more combustible material. Well-baked bricks will resist fire, but at least one manufacturer found it was unsafe to place them on boards, since they acted as reservoirs for the heat conveyed through super-heated steam-pipes, altered the texture of wood, and at last set it on fire, causing a loss of $4,000.

The construction of drying rooms and boxes is very important. Perhaps the two worst can be found in a piano factory, where a box-stove outside is fed with shavings trailed along the floor, and a red-hot stove pipe passes directly through the adjacent drying box. The same factory can show a small drying room filled with light wood, with a small cylinder coal stove in the center, having pine blocks for fuel, and being kept at a red heat. The most common device to plague underwriters is the "pot furnace" to heat drying rooms, with the torrent of heated air pouring up through conductors. This has been the common way of vulcanizing rubber goods, and is still used very generally with metallic articles. A wire manufacturer placed his coils of wire, dripping with liquid from the wash room, in drying rooms, and brought them to a red heat, unmindful of his wooden doors and wooden beams to support his metallic ceiling, until two fires forced him to suspend his operations and to substitute brick and iron. Steam pipes are now very generally used, as being cleaner and probably safer. But not once in a hundred times will a thermometer be found within, and many proprietors would be surprised at the degree of heat attained. In the rubber vulcanizer's, 240° to 270° is the general rule, and the number of steam pipes is limited to prevent the workmen bringing the temperature to 350°, and thus injuring the fabrics. Instead of using a thermometer to register the heat, most manufacturers simply trust the engineer to carry a certain number of pounds of pressure in his boilers, and take no account of the accumulation of heat by radiation and reflection, especially when the room is lined with a metallic surface. Then the heat from steam pipes is intensely dry and absorbs from the wood the moisture, fitting it to conduct fire rapidly. It is well known that the motion of long lengths of pipe through contraction and expansion wears considerably upon pipes, but may it not be often true that the electricity developed by friction, especially of upper belts, may be conducted through the piping, and elicit the spark necessary to set wood on fire?

The great hazard in drying rooms is dust, and the feathery lint which gathers everywhere. It is minutely subdivided, and only needs the addition of a drop of oil from machinery to become highly combustible. This was well illustrated in a room used to dry animal hair by superheated steam. The larger coils were carried against the outer walls, while subordinate coils passed through the center of the rooms, raised six inches from the floor, and a like distance below the boards used for shelving. Yet even here the dust accumulated on the pipes, took fire, and the tiny tongue of flame leaped to the shelving, costing the underwriters $2,200, although a live steam jet had been prepared to meet this emergency.

Can these instances give any clew to necessary precautions? 1. Make the drying box and room as safe as is practicable. 2. Procure careful inspection by some one who will recognize the fire hazard. 3. Invite examination by an experienced electrician. 4. Keep the rooms strictly clean at all times, and prevent contact of combustible material with means of heating. 5. Take particular care when the product of manufacture is specially combustible. 6. Give special attention to the means of ventilation.

French Academy Prizes.

The French Academy of Sciences have recently published a list of the prizes offered by them for essays on scientific subjects during this year, and until 1886. In applied mechanics the Fourneyron prize will be given for the best "study, both theoretical and experimental, of the different methods of transporting force to a distance." The papers must be lodged before the 1st of June next. A grand prize will be awarded in 1884 for a mathematical solution of the problem "to perfect in some important point the theory of the application of electricity to the transmission of power." The prize will consist of a medal valued at 3,000 francs. The memoirs must be submitted to the secretary of the Academy before June 1, 1884, and should be anonymous, but accompanied by a sealed envelope with the real name and address of the author. The Bordin prize, which was not awarded this year, is carried on to 1885, and memoirs must be lodged before June 1 of that year. The subject is a "research into the origin of electricity in the atmosphere, and the causes of the great development of electric phenomena in storm-clouds." The prize is a medal worth 3,000 francs.

An Improved Sleeping Car.

Mr. John A. Sleicher, formerly manager of the New York State Associated Press, and more recently one of the editors of the Troy *Times*, at Troy, N. Y., has patented a new sleeping car, with the seats, each six feet long, extending nearly across the width of the car. They are so arranged that each seat at night can, with very little trouble, be changed into an upper and lower berth, extending transversely across the car. At the same time each section, by sliding panels extending to the roof of the car, is converted into a private apartment, entirely cut off from intrusion. Absolute privacy, with an aisle in which to stand and dress, is thus given to each section. Ladies will especially appreciate the advantages of the "Sleicher Stateroom Sleeping Car." Negotiations are already in progress with a leading railroad trunk line, which desires to experimentally use one of the new sleepers. The new car bids fair to revolutionize that branch of the railroad business.

The Brayton Petroleum Engine.

Attention is called to the manufacturers' advertisement in another column. Ten gallons of unrefined petroleum are said to give a constant power equal to five horse power for ten hours. Crude petroleum costs about six or possibly eight cents a gallon, making that the cost of five horse power per hour.

The engine is run by the combustion of the vapor of petroleum united with atmospheric air under pressure. The combustion is not intermittent, or explosive, like that of gas in a gas engine, but is continuous, and the engine is driven by the expansion of the products of combustion, the expansion being about six volumes. The motor, it is stated, has been fairly tried, and appears to be constructed upon reasonable principles. For small powers, and especially for intermittent power requirements this motor appears to be well adapted.

Intensifier for Gelatine Plates.

The chemical now mostly used in intensifying gelatine plates is bichloride of mercury in combination with ammonia, iodide or cyanide of potassium. The main difficulty of such intensification has been that it was not stable; in a short time the image on the plate, if exposed much to the light, would fade out, and spoil the negative. The intensifier given below has been found to work well, and at the same time possesses the quality of being absolutely stable.

A stock solution of sulphate of iron is made as follows:

Sulphate of iron	15 grains.
Citric acid	15 "
Water	1 ounce.

A second solution is made as follows:

Water	1 ounce.
Nitrate of silver	10 grains.
Acetic acid	10 minims.

To intensify, take enough of the iron solution to cover the plate, and add thereto from six to ten drops of the silver solution, flood the plate, and the intensification will proceed in a clear, gradual, and satisfactory manner. To produce a great degree of intensity more of the silver solution should be added, a few drops at a time.

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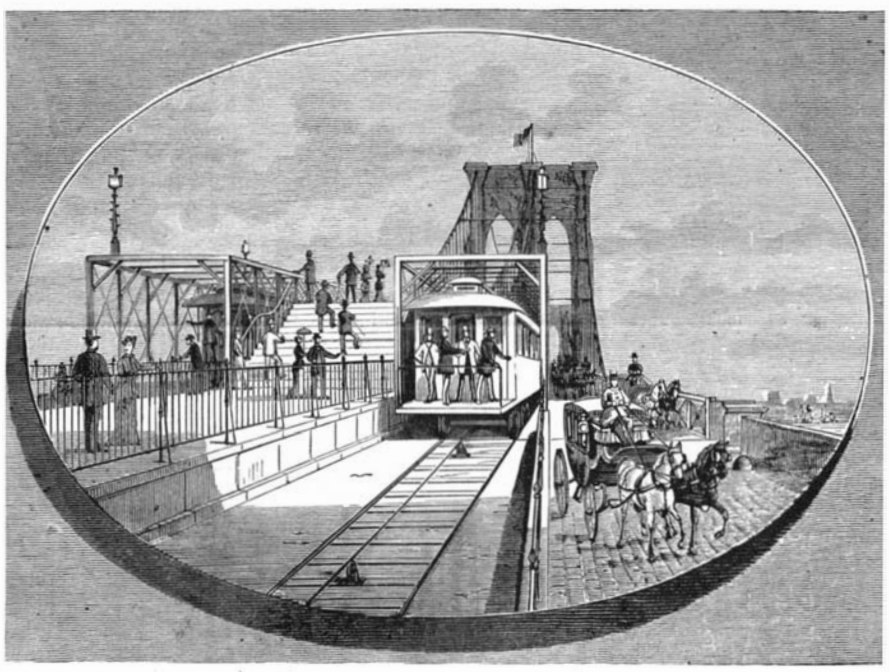
AN ACCIDENT ON THE GREAT BRIDGE.

The great bridge between New York and Brooklyn was the scene of a painful tragedy on the 30th ult., Decoration Day. At three P. M., when the footwalk was thronged with visitors, enjoying the novelty of the structure and the beauty of the river scene, suddenly, at the west stairway, a woman's cry was heard; she had fallen on the steps. The crowd on the walk above pressed hastily forward to see what was the matter; those in front, at the edge of the stairs, resisted, became locked and packed together, and in this helpless condition were borne forward by the weight of the surging crowd behind and swept down the stairs, crushing upon each other and against the railings—a writhing, bleeding mass of humanity. Thirteen men, women, and children were killed and many injured. Such was the nature of the accident. It was plainly due to the stupidity of the bridge managers. Ordinary common sense teaches that upon such a highway as this, thronged by millions of people, there should be no stairways or other man-traps. Smooth, straight pavements should be provided. The managers have made broad and elegant passages for horses. Now let them do as much for human beings.

Our engraving shows the locality of the accident. The stairs are only twelve feet high. To prevent a recurrence the trustees and engineers are now talking about having dividing rails on the stairs, stationing more policemen, putting up telephones, and other arrangements. So long as the stairs remain the liability to accident will continue.

One of the detectives who was on duty between the staircase and the point where the foot-bridge is narrowed for thirty feet by the passage of the cables, said that he was sure no part of the bridge was better guarded than that where the accident happened. Where the foot-bridge narrows is a favorite stalking ground for pickpockets, for there is always a prospect of a squeeze there, if anywhere. This detective said:

"The crowd was not particularly large during the afternoon, not so large as we had expected, for unusual preparations had been made to guard against disturbances of any kind, and the ordinary police force was about doubled, counting the detectives and special officers. I was watching for pickpockets, when there was a shriek from some women at the New York stairway, and I started that way, thinking that a fight was going on; we had a good many rough characters crossing, but until then the utmost good nature and order had prevailed. Before I got thirty feet I was almost taken off my feet by the crowd rushing behind me from the Brooklyn side. Some ran toward the crush simply from curiosity, others in mere sport and wish to create a little squeeze for the fun of hearing the women scream, and a great many ran and struggled forward, when stopped, because they believed that the bridge behind them was falling down, and their only hope of getting to land was to press forward to New York. Very few seemed to know that the trouble was all in front of them, and not behind. The pressure of the crowd was the most terrible I have ever known; I saw persons with the blood streaming out of their mouths and noses from the squeezing they received. It was wholly useless to try to argue or talk to people, for the real pressure came from hundreds of feet away; you might just as well have shouted at the waves, and, besides, the noise of shrieks, cries, and curses was so great as to drown any orders. Those who tried to hold on to the iron railings at the sides of the bridge were carried along with the crowd, with their hands bleeding and their bodies crushed against the iron work. A platoon of police would have been of no avail."



SCENE OF THE LATE ACCIDENT ON THE GREAT BRIDGE.

Distillation of Bituminous Coal.

In an address delivered in Manchester, England, Mr. Walter Weldon, chemist, described the usual methods of burning coal to produce heat, and gave the results of the imperfect and wasteful consumption of coal in the open grate and under boilers. He said that it was difficult to insure the complete combustion of coal even in making a chemical analysis, and in the open grate it is impossible. By dry distillation a ton of coal can be made to yield twenty pounds of ammonium sulphate, worth 3s. 5d. (80 cents). The soot that lodges in the chimneys and defiles furniture and buildings would yield coal tar, the basis of valuable dyes. To these direct pecuniary losses should be added others, as charges for repainting smoked rooms, medicine and doctors' bills, caused by sickness from acid vapors in the atmosphere, and the waste of heat by building the fire at the end of a tube leading into the outer air.

As a remedy for this loss by waste and these injuries to health, Mr. Weldon said that coal should be distilled in close vessels, and all the products of such distillation should be collected. The gas would serve to distill fresh coal and to work gas engines to generate electricity for light. The ammonia would make a superior fertilizer for land. The tar would be manufactured into dyes, and the residuum of coke would be superior for domestic heating purposes and steam making to the original coal.

ASPECTS OF THE PLANETS FOR JUNE.

VENUS

is morning star, winning the place of honor on the list for the beautiful picture she paints on the morning sky, and for contributing the largest share of incidents to the June planetary record. As she retraces her steps toward the sun, moving eastward, she passes Neptune on the track moving eastward.

The planets are in conjunction, or in the same right ascension, at eight o'clock on the morning of the 8th, being only ten minutes apart at the nearest approach. They will be near each other when they rise about three o'clock on the morning of the 8th, an hour and a quarter before sunrise. Venus may be readily recognized, but Neptune is invisible even in large telescopes. Therefore the conjunction must be seen in the mind's eye, where imagination brings out the scene in brighter coloring and magnified dimensions. The fairest of the stars in gibbous phase hangs side by side with the tiny, ill-defined orb, dwarfed by distance to proportions feebly representing the huge sphere that ranks third in size among the members of the solar family.

Venus, having paid her respects to Neptune, next encounters Saturn in her course. She meets him on the 19th at seven o'clock in the evening, when she passes thirty-five minutes north of him. The planets are then below the horizon and invisible, but on the morning of the 20th, bright-eyed observers may easily find them. They rise about three o'clock, more than an hour before the sun, Venus being a little northeast of Saturn, and three and a half degrees south of the sunrise point. After the conjunction, while Venus grows fainter and smaller as she approaches the sun, Saturn increases in size and brightness as he increases his distance from the sun, and approaches the earth.

The right ascension of Venus is now 2 h. 42 m., her declination is 14° north, and her diameter is 12″.

Venus rises on the 1st about nine minutes after three o'clock in the morning; on the 30th, she rises about six minutes after three o'clock.

MARS

is morning star. At the beginning of the month, he is the first of the four planets ranking as morning stars to appear above the horizon. The order of succession is Mars, Venus, Neptune, Saturn. The ruddy planet is really coming into notice, and may be found shining as a small red star in the constellation Aries, being more readily picked up as there are no stars of note in his vicinity. He wanders undisturbed on the celestial track until the 26th, when he is overtaken by Neptune at eleven o'clock in the evening. The two planets are then in conjunction, Mars passing 1° 7′ north. The conjunction is invisible as far as Neptune is concerned, but it illustrates the adage that "Things are not what they seem." Both planets are moving westward, and though Mars in reality is nearer to us and travels faster, he is apparently overtaken by Neptune, who passes him and reaches opposition two months earlier.

The earth revolves twice in her orbit while Mars revolves once in her orbit, and then it takes her fifty days to catch up with him and come into line or complete a synodic revolution. In the case of Neptune, the earth revolves once in her orbit, and only requires two days more to come into line with him and complete a synodic period. It must be remembered that we are viewing our brother and sister planets from the earth, which is a moving observatory, and though the movements of the "wanderers" in the heavens are apparently anomalous, they are in reality as symmetrical as clock work.

The right ascension of Mars is 1 h. 59 m., his declination is 11° 14′ north, and his diameter is 4·8″.

Mars rises on the 1st about a quarter before three o'clock in the morning; on the 30th, he rises a few minutes before two o'clock.

NEPTUNE

is morning star. He meets Venus on the 8th, and overtakes Mars on the 26th, events that have been already described. At the end of the month he is the first of the morning stars to appear above the horizon.

The right ascension of Neptune is 3 h. 9 m., his declination is 15° 56′ north, and his diameter is 2·5″.

Neptune rises on the 1st at half-past three o'clock in the morning; on the 30th, he rises at half-past one o'clock.

SATURN

is morning star, and contributes but one incident to enliven the records of the month, his conjunction with Venus on the 19th, previously referred to. He is now partially hidden in the sun's bright beams, but he will soon emerge from seclusion, and, clothed in glorious apparel, will grace the summer nights with his serene radiance.

The right ascension of Saturn is 3 h. 57 m., his declination is 18° 37′ north, and his diameter is 15·6″.

Saturn rises on the first soon after four o'clock in the morning; on the 30th, he rises about half-past two o'clock.

JUPITER

is evening star. Though drawing very near the sun, and approaching his greatest distance from the earth, he will be a bright and beautiful object in the evening sky during the month. Never in his departing glory has he put on a more attractive aspect. No observer can behold him gracing the twilight sky and serenely shining without being impressed by the majesty and princely dignity of his presence. While near proximity to the sun obscures every other planet but Venus, Jupiter shines with a brilliant luster in the near presence of the great orb he closely resembles. A period of intense activity is passing on the Jovian borders. The great spot has disappeared, but the wondrous belts take on every manner of varied form, and every tint of the rainbow, thus bearing testimony to the tremendous commotions that agitate his chaotic mass, and that millions of years hence will make the giant orb a fit abode for animal and vegetable life.

The right ascension of Jupiter is 6 h. 24 m., his declination is 23° 21′ north, and his diameter is 32·6″.

Jupiter sets on the 1st at a quarter after nine o'clock in the evening; on the 30th, he sets at a quarter before eight o'clock.

URANUS

is evening star. On the 10th, at one o'clock in the morning, he is in quadrature with the sun, half way between opposition and conjunction.

The right ascension of Uranus is 11 h. 21 m., his declination is 4° 58′, and his diameter is 3·6″.

Uranus sets on the 1st at one o'clock in the morning; on the 30th, he sets at a quarter after eleven o'clock in the evening.

MERCURY.

is evening star until the 7th, and morning star the rest of the month. On the 7th, at 11 o'clock in the evening, Mercury is in inferior conjunction with the sun. After this event, he passes to the sun's western side and swells the list of morning stars to five members, including Mars, Venus, Neptune, Saturn, and himself.

The right ascension of Mercury is 5 h. 17 m., his declination is 21° 52′ north, and his diameter is 11·16″.

Mercury sets on the 1st at eight o'clock in the evening; on the 30th, he rises about a quarter after three o'clock in the morning.

THE MOON.

The June moon fulls on the 20th, at twenty-three minutes after eleven o'clock in the morning, Washington mean time. The old moon is in conjunction with Mars and Venus on the 2d, and with Neptune on the 3d. The slender crescent less than a day before new moon is close to Saturn on the 4th, being two minutes north at four o'clock in the morning. Unfortunately for terrestrial observers, the sunlight hides the beautiful phenomenon from mortal view. This conjunction, as well those of March, April, and May, show how nearly the moon's path coincides at present with that of Saturn, and how near the conjunctions are to occultations. Saturn is occulted in his geocentric position, that is, as seen from the center of the earth, nine times during the year, though in no case is an occultation visible in Washington. The conjunction of the moon and Saturn on the 9th of April, a simple conjunction in Washington, New York, and New England, was a superbly beautiful occultation as observed in Illinois and Iowa. The new moon of the 5th is near Mercury on the evening of her advent, at her nearest point to Jupiter on the 6th, near Uranus on the 12th, the day of the first quarter. She pays her respects to Neptune for the second time on the 26th, and ends the month's work with a second conjunction with Mars on the 30th, three days after the last quarter, planet and crescent making a picture fair to see on the morning sky.

AT a German ultramarine manufactory, managed by a pupil of Liebig, the director has observed that for forty-four years none of his workmen have ever suffered from consumption. He attributes their immunity to the fact that the process of manufacture involves the constant production of sulphurous acid, by the burning of sulphur. Accordingly he suggests a new method of treatment for consumptive patients, by bringing them into an atmosphere moderately charged with sulphuric acid.

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A NOVEL AIR MOTOR.

The engraving shows an air motor in which the expansion and contraction of air in a flexible receptacle is the motive power. It is a well established fact in pneumatics that air will expand three-eighths of its bulk between a freezing temperature and the boiling point of water—in other words, that eight measures of air at the freezing temperature become eleven at the boiling point of water. It is also well established that air preserves an equable rate of expansion at all temperatures. Its increase of bulk, for example, being the same from zero to 100° as from 100° to 200°, and as its expansion from 32° to 212° Fahrenheit amounts to three-eighths of its bulk at 32°, it follows that every degree on this scale corresponds to a change in its bulk amounting to $\frac{1}{480}$ of the bulk at 32°.

If a hermetically sealed vessel containing air be subjected to heat, the expansion of the air within it produces a pressure increased in proportion to the heat applied, and, under certain circumstances, in proportion to the volume of the air contained within the vessel, and it is with a view of utilizing this power that the apparatus shown in the engraving has been devised. A flexible cylinder, preferably made of silk, impervious to air, and having solid heads fixed to it at either end, is provided with rings placed at intervals in the silk cylinder to prevent collapse when subjected to external pressure. If this hermetically sealed cylinder is collapsed, and at the same time contains a certain volume of air, it follows that, owing to the construction of the cylinder, should heat be applied to it, the expansion of the air within it will force its two heads apart, and these heads will again come together when the air within the cylinder has cooled down to its original temperature.

To utilize this expansion and contraction, the lower head of the cylinder is fixed to a table. The other end is provided with friction rollers held opposite to each other on the said head, and brought in contact with the vertical guide bars. The cylinder is in this manner held in a vertical position, while it is free to move by the expansion and contraction of the air within it.

Two rods connect the top with a crosshead provided with friction rollers, which work on the vertical guides. The weight of the cylinder head and crosshead is balanced by counterbalance weights, connected to the crosshead by chains passing over pulleys held in brackets in the framework of the machine. By this system of counterbalancing the force produced by the expansion of the air will have exactly the same effect on the mechanism as an equal force produced by the contraction of the air within the cylinder.

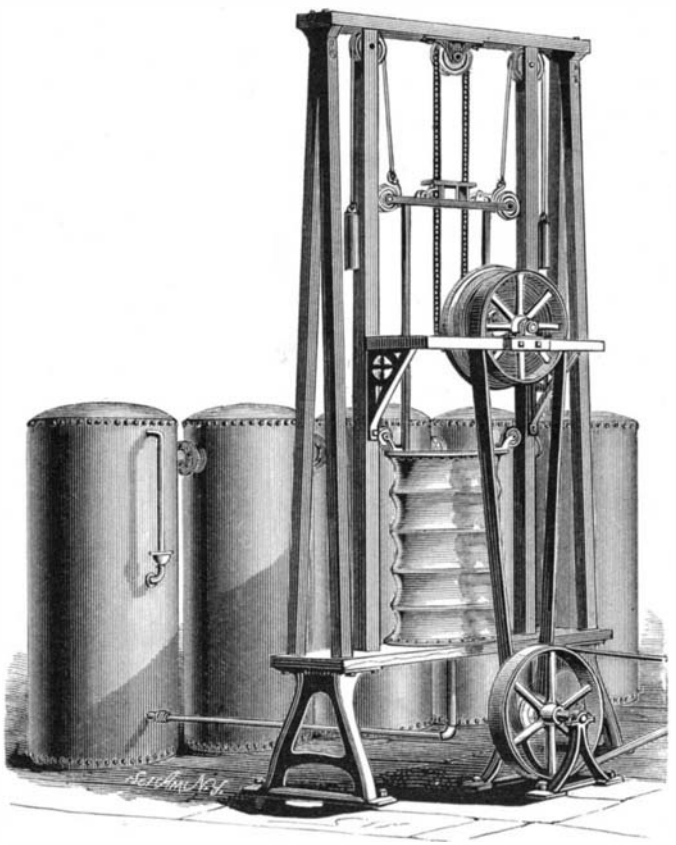
An endless chain passes round pulleys and through holes in the crosshead, and the crosshead has pivoted on it two dogs, one of which is set against the chain, so that it will engage it when the crosshead ascends, while the other is set so as to engage with the same chain, but on the opposite side of the pulley, when the crosshead descends. By this arrangement of dogs the pulleys will always revolve in the same direction, whether the crosshead moves up or down in its guides. As the volume of air within the vessel or cylinder would not in itself be sufficient to produce a power applicable for practical purposes, an additional vessel is provided which is also hermetically sealed, and connected by a pipe to the flexible cylinder.

The number and size of the reservoirs can be indefinitely increased, but five only are shown in our illustration.

Although the greatest motion will be produced when the temperature changes to the greatest extent, it will be understood that upon every slight change in the temperature the motor will be affected more or less. If exposed to the bright rays of the sun, the air will expand. Should the sun become clouded for a short period, the air will naturally contract, and so on during the whole day, at each and every change of the temperature, the air either expands or contracts, and consequently the apparatus imparts to the motor a power given out as described.

As the movement of this apparatus will be irregular, sometimes fast and sometimes slow, and sometimes imparting no movement at all, the inventor applies a spring mechanism devised to store the power produced by the motion of the apparatus.

This machine will hardly be classed among perpetual motion machines of the usual types, as it has an ever varying force of nature behind it which will cause it to operate so long as heat and cold alternate, or until the machine is destroyed by wear or time.



FOSTER'S ATMOSPHERIC AIR MOTOR.

This motor has been patented by Mr. Benjamin J. Foster, of Glen William, Ontario, Canada.

Zapallo Fruit.

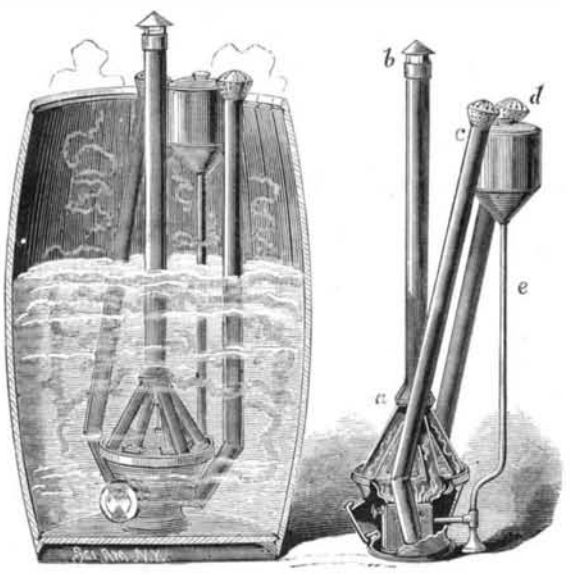
The fruit of the zapallo, a cucurbitaceous plant of Uruguay, appears to afford a most wholesome food. It is cut up with the saw, because the rind is too hard for a knife to penetrate. It is firm, of a yellow color, a sweet amylaceous flavor, and slight smell resembling that of the carrot. The most esteemed quality, called rubango, has a ligneous rind of a dark green color, with orange pulp, and white oily seeds. The relative proportions are: Seeds, 4; pulp, 39; and rind, 57. According to M. Sace, the chemical composition is as follows: Gum, 0·44; sugar, 2·52; starch, 13·73; fibrine, 0·47; lignose, 0·22; ash, 0·81; water, 81·81; total, 100.

IMPROVED WATER HEATER.

We give an engraving of an improved apparatus for heating water in large or small quantities, without trouble and with very little expense. The heater is more particularly designed for use in places where water backs and hot water boilers are not provided; but it may be used to advantage wherever hot water is required. It will be found very useful for stablemen, dairymen, farmers, and others.

The apparatus is to be submerged in water contained in a barrel, tank or other suitable receptacle. The fuel used is oil or gasoline.

The body, *a*, of the heater is made of sheet metal, and has flaring sides and a broad base. In one side there is an opening closed with a screw cap, which is packed to make it water-tight. This opening is to give access to the burner for lighting or adjusting. The closed top of the body, which is of copper, is provided with a series of tubes communicating with a central tube, *b*, which leads upward and forms a chimney to convey the products of combustion above the surface of the water in which the heater is placed. Two inclined draught tubes, *cd*, extend above the surface of the water and supply air to the flame in the body, *a*.



WEBSTER'S IMPROVED WATER HEATER.

The burner used in the heater may be of any approved pattern for burning kerosene or gasoline. The liquid fuel is supplied through the tube, *e*, from the reservoir above. To heat a quantity of water with this apparatus the cap is unscrewed, the burner lighted, and the cap replaced after the flame is properly regulated. The heater is then plunged in the water, which, being in contact with highly heated surfaces, soon becomes heated.

This apparatus is convenient for heating water for bathing purposes, for laundry and for indoor as well as out of door uses.

This useful invention has been patented by Mr. John B. Webster, of Los Angeles, Cal., who may be addressed for further information.

THE total number of puddling furnaces in operation at the end of 1882 in the United Kingdom was 4,369, being 814 less than in the preceding year.

Protection for Glass Vessels.

Dr. E. Schaal, a chemist in Stuttgart, writes as follows in the Wurtemberg *Gewerbeblatt:*

In chemical laboratories it is customary to put a coating of clay on glass vessels that are to be exposed to a temperature that would soften or melt the glass, or where they are liable to be broken by draughts of air. Sometimes cow's hair or asbestos is mixed with the clay to strengthen it. Although this mass is cheap it is liable to fine checks and cracks, or it scales off, which frequently causes the glass to break.

I have recently been using, with better results, a mixture of infusorial earth and water-glass, which, if properly applied, will last for weeks and hence is not expensive, while it protects and strengthens the vessel to such an extent that I have, for the sake of experiment, heated thick but cracked retorts that were protected in this way to 400° or 500° C. (932° Fahr.) when exhausted almost to a vacuum, and yet they did not break, or collapse. It is important to make this mixture so that it shall form a soft and somewhat elastic, but not liquid, paste. A mixture of one part by weight of infusorial earth with 4 or 4½ parts of water-glass will fulfill this end approximately; the exact proportions cannot be given because commercial water-glass differs in strength, and the infusorial silica is not always dry.

The part of the vessel to be protected is covered one-fifth to two-fifths of an inch thick and dried at not too high a temperature, and it is better to dry in a drying closet or on a support over the stove. If the temperature is too high at first, it will cause air bubbles in the mass and it is not so good then. It can be dried by swinging it back and forth over a flame, the bubbles being prevented by pressing them out. If a crack appears, it is plastered over with more of the mixture and allowed to dry again. If some parts of the vessel are to remain transparent, they may be protected by water-glass alone by applying several thin coats and letting each dry before putting on the next.

There is no doubt that the same mass can be used to cover gas retorts, furnaces, stoves, and walls, just as well as for glass and porcelain utensils.

The editor of the *Gewerbeblatt* adds that the disadvantages which the author refers to of using potter's clay, water, sand and calf's hair for protecting glass and porcelain can be entirely overcome by mixing up the mass with a little glycerine. This cheaply and easily prepared mass is thus rendered very easy to apply, always retains its desired softness, and never cracks nor checks.

Covering Tables and Writing Desks.

The *Neueste Erfindungen* gives the following practical directions for covering tables etc., with cloth or leather:

Thick rye paste is boiled with thick turpentine (not the oil) slightly warmed. Thin strips of wood are then prepared not over 1⅜ inches wide and ¼ inch thick, and the sharp edges trimmed off. The best thing is a shade roller cut lengthwise, and the round side put downward. The cloth is stretched at one end and one side, to such a lath and basted fast to it, but the lath must lie two inches from the edge of the veneering (inside), and the cloth must extend half an inch beyond the edge of the veneer, because it will be shorter in spite of the stretching. The lath may be tacked at intervals of six inches apart.

After one end and one side are fastened the cloth may be stretched and basted around laths on the other two sides so as to form an inner border or frame two inches from the edges. The paste is then applied to the top of the table close to the veneer but not too near the lath, perhaps 1½ inches from it, and the cloth that projects beyond the laths is pressed down on the paste and rubbed against the edge of the veneer with the finger nail. There will be little folds in the cloth where it is basted, and these must be stretched out in pasting it down. It is then left to dry and the excess of cloth trimmed off with a sharp knife. Care must be taken in trimming it off, especially when the veneer is thin. If the cloth is cut back too far, a narrow strip should be pasted in between. The laths are then carefully removed and the cloth brushed off.

The cloth should be put on so that the nap runs toward the front of the table if its length permit of doing so.

In covering a table with morocco, of course these strips of wood cannot be employed.

To preserve its luster the leather is evenly but not too strongly moistened on the wrong side with pure water to which a little vinegar is added. The whole top of the table is covered with paste and the leather laid on and smoothed out by scraping from the middle toward the sides.

If one skin is too small they should not be joined in the middle, but a seam may be made near each end. The edges are cut with a rule and sharp knife and placed close together. A modeling iron, to be had of any book-binder, is run over these joints and along the edges. It is not necessary to heat the iron, but it is well to do this if the leather is not dry yet.

THE experiment of electrically lighting the dining room and libraries of the House of Commons has, it is stated, cost more than £2,000, but the Commissioner of Works contracted to pay a sum not exceeding £900.

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ATMOSPHERIC DUST AND GERMS.

Atmospheric dust and germs have been the subject of a profound study for the last few years at the Observatory of Montsouris, and the results obtained have recently been communicated to the Faculty of Medicine, of Paris, by Mr. P. Miquel, chief of the micrographic service of the former institution.

Mr. Miquel did his collecting with an aeroscope (Fig. 1) invented by Mr. F. A. Pouchet. This apparatus consists of a cylinder of small diameter connected with an aspirator, and provided with a plate of glass covered with glycerine for receiving and retaining the minute bodies carried along by the current of air.

The number and variety of the spores that are disseminated by the air is found to be immense (Figs. 2, 3, and 4). The spores of *Penicillium* and the cells of *Protococcus* and *Chlorococcus* are almost always present in great abundance. Mr. Miquel applied himself at the outset to the counting of these organisms, and to estimating the number that existed in each cubic meter of air, and thus succeeded in determining what influence the seasons, temperature, dryness, and moisture had upon their development. The results are as follows: The number of spores belonging to moulds is small in January and February, very small in March, increases in April and May, reaches its maximum in June, and finds its minimum in December. The number of such spores per cubic meter of air was found to be, on an average:

January	7·000
February	7·000
May	12·000
June	35·000
August	23·000
October	14·000
November	8·000
December	7·000

Heat is not the most important factor in the development of these bodies, but the hygrometric state of the air is. This was to be foreseen as a deduction from the researches made on this subject by Mr. Pasteur. Storms are always followed by an increase in the number of cryptogamic germs; but mineral dust and a few species of microbes, on the contrary, remain fixed to the soil through dampness.

The exact determination of the peculiar vegetations for which the atmosphere serves as a vehicle is made through cultures—the air or water containing the organisms being made to pass into liquors favorable to their nutrition. The liquors used for this purpose are the mineral solutions of Pasteur and Cohn, infusion of hay and beet, neutral urine, beef or chicken broth, and Liebig's extract of beef. The difficulty consists in having these solutions absolutely free from all living organisms. Recourse has been had, without success, to ebullition at 100°—a temperature sufficient to coagulate protoplasm, the physical basis of life, according to Prof. Huxley. Certain spores, however, resist the action of boiling water for several hours.

Mr. Koch extols the method of discontinuous heating for sterilizing liquors. He raises the latter to a temperature lower than 70° in order to kill the adult bacteria, and then allows them to cool so as to give the spores time to germinate, and finally raises the temperature again in order to kill them. Mr. Miquel, however, formally attacks this method, as he considers it inefficacious owing to the uncertainty that exists in regard to the exact period of evolution of certain germs. He also recommends operators not to rely upon the limpidity of the liquors as a test of their sterilization; for there are liquors, Cohn's for example, which are not deprived of active germs after an ebullition of four hours at a temperature of 100°.

It results from experiments that have been made that beef broth, neutralized by potassa and kept for two hours at a temperature of 110° in closed vessels, remains indefinitely sterile. Sometimes, a temperature of 150° ought to be reached or even exceeded, for Mr. Miquel has characterized a bacterium which resisted a temperature of 145° for two hours.

Yet heat offers one drawback, and that is that it weakens the nutritive properties of the organic liquids. An effort has therefore been made to dispense with it and to substitute for it a filtration through porous substances. For this purpose Mr. Miquel has used at Montsouris the apparatus shown in Fig. 5. This consists of a glass bulb, *b*, with a long neck, *t*, having a lateral tubulure, *p*, and being surmounted with a funnel, *e*.

Plaster and asbestos having been placed in the funnel, the bulb is raised to a high temperature in a stove, and sterilized water is then introduced through the tubulure, *p*, and raised to the boiling point. Before the water has entirely disappeared the tubulure is closed by means of a blowpipe, and, when a cooling occurs, a vacuum is produced in the bulb. The broth, being poured in a cold state over the mixture of plaster and asbestos, filters slowly through it, deposits its germs therein, and enters the bulb absolutely devoid of organisms.

During summer, in order to prevent putrefaction, the funnel and vessel, V (Fig. 6), are surrounded with ice. This cold process succeeds better than any other tending to the same end.

The sowing of atmospheric germs in nutritive liquids is done by means of special matrasses resembling in form those used by Mr. Pasteur. The culture liquid is introduced into these through suction, then the slender extremity is closed by melting it in a lamp, and finally the liquid is sterilized by heat. In order to make sure that no atmospheric germ has got into the bulbs while being filled, the latter are tested by allowing them to remain for a month in a stove at a temperature of 30°–35°. If they do not become turbid, they are considered as adapted for the sowing. This latter is effected in different ways. If it concerns rain water, the latter is collected in the collector, P', of a rain gauge (Fig. 8). This collector is carried by a movable arm, so that the operator placed at a distance can take it and put it very gently under the funnel, E, of the apparatus.

Mr. Miquel has applied this arrangement to the estimation of the number of bacteria contained in rain-water, and has thus ascertained that at the beginning of storms such water contains fifty of these organisms to the cubic centimeter, and that this number soon begins to diminish, although it increases again at times at the end of a few days of damp and rainy weather. It seems, then, that bacteria are capable of multiplying in the clouds, or that the latter become charged with them mechanically during their travel through space. At Montsouris, out of 100 bacteria contained in a drop of rain-water, there were, on an average, 28 *Micrococci*, 63 *Bacilli*, and 9 *Bacteria*. In the air the proportion was 66 *Micrococci*, 13 *Bacilli*, and 21 *Bacteria*.

The development of these little organisms in sown liquors is followed under the microscope by means of the *moist chamber*, an invention of Messrs. Van Tieghem & Lemonnier. This apparatus (Fig. 9) consists of a hollow glass cylinder, H, at the bottom of which there is placed a little water, which is afterward covered with a thin piece of glass, LL, To the under surface of this latter is attached the culture liquid containing the spore that is to germinate therein, both being introduced by means of the rod, T. The moist chamber is placed on the stage, PP, of the microscope, under the objective, O. Mr. Miquel has in this way studied the evolutions of a bacillus, which afterward became transformed into a micrococcus (Fig. 10). He has also shown the phenomenon of the devulcanization of India-rubber, through a bacterium which is very frequent in sewage waters. This schizophyte furnishes nascent hydrogen, and, in the presence of sulphur, gives hydro-sulphuric acid. In-

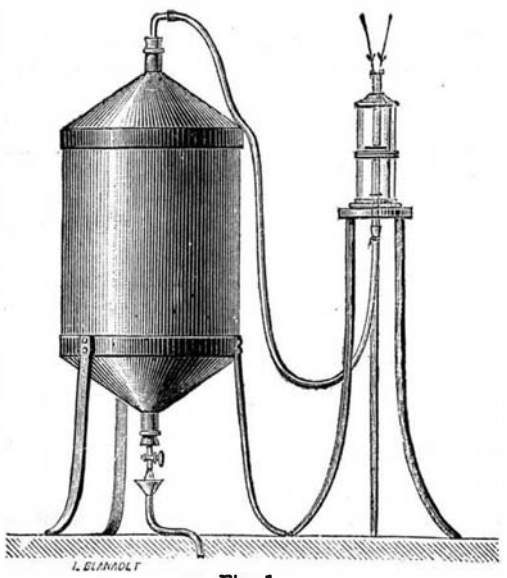


Fig. 1.

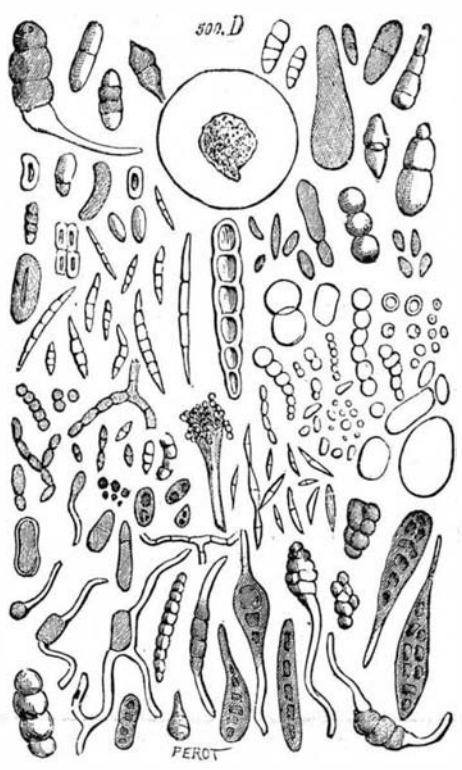


Fig. 2.

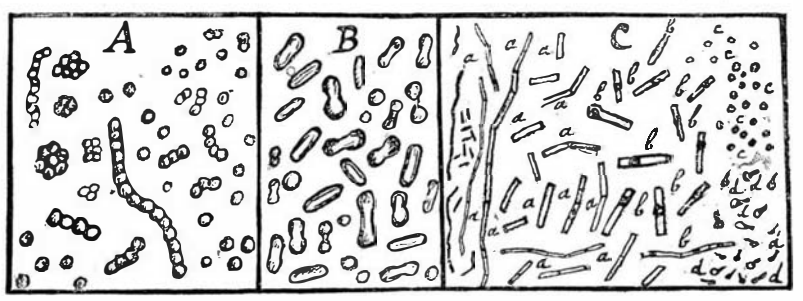


Fig. 3.

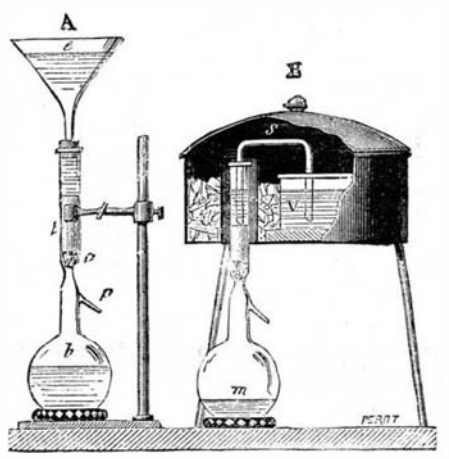


Fig. 5.

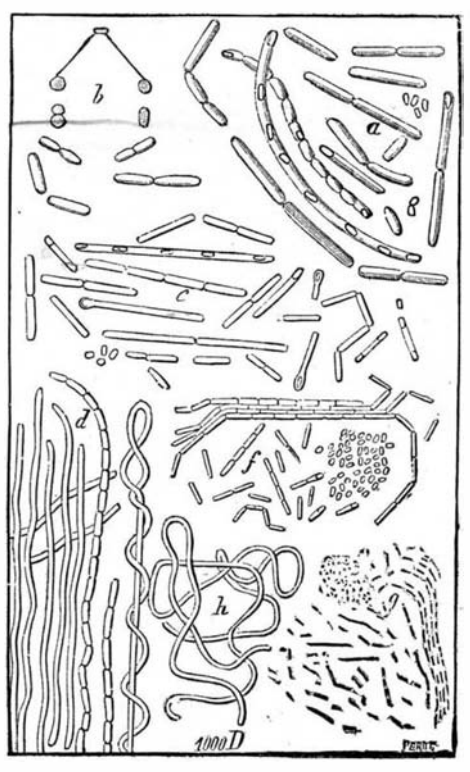


Fig. 4.

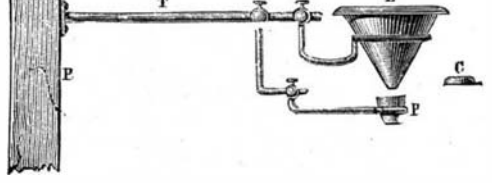


Fig. 8.

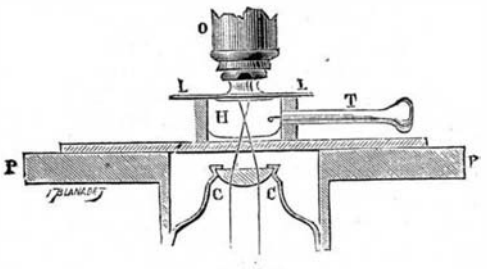
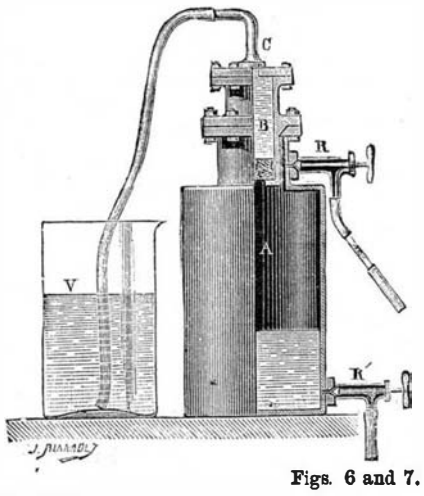
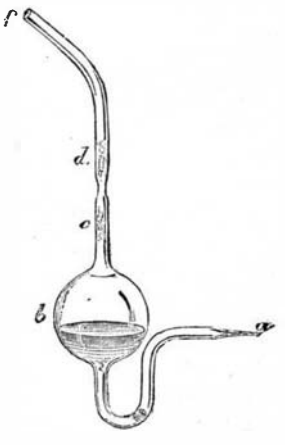


Fig. 9.





Figs. 6 and 7.

ATMOSPHERIC DUST AND GERMS.

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troduced with the ferment of urea into a solution of urea, into which dip sulphureted papers, it gives hydro-sulphate of ammonia.

The methods that we have just described have given very interesting results, and have shown that there exist, on an average, 80 bacteria to the cubic meter of air. The maximum occurs in autumn, and the minimum in winter. The average numbers are as follows:

December and January	50 bacteria.
February	33 "
May	150 "
June	50 "
October	170 "

Contrary to what occurs in moulds, the number of schizophytes, which is small during rainy weather, rises when all the dampness has disappeared from the surface of the soil.

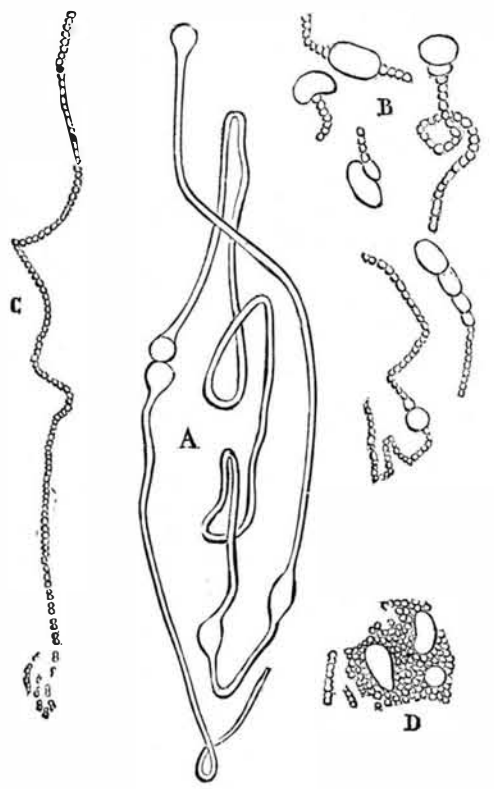

Fig. 10.

The action of dryness is greater than that of the temperature. It seems, in fact, as a result of numerous experiments, that the water evaporated from the surface of the soil never carries schizophytes with it. Dry dust, on the contrary, that from hospitals principally, is charged with microbes. As a result of comparative experiments made in Rue Rivoli, and at Montsouris, it appears that the air contains nine times as many bacteria in the interior of Paris as in the vicinity of the fortifications. The influence of the dominant winds is notable. That from the northwest reaches Montsouris laden with a considerable number of bacteria. This is the wind that blows from the hills of La Villette and Belleville. Then come the winds from the east, north, and northwest. The south wind is less charged with these organisms. The distribution of microbes in a vertical direction indicates that they are derived from the mud and dirt of the streets and dwellings. A cubic meter of air, which contains but 28 of them at the summit of the Pantheon, contains 45 at the Park Montsouris and 462 at the Mayoralty of the fourth ward.

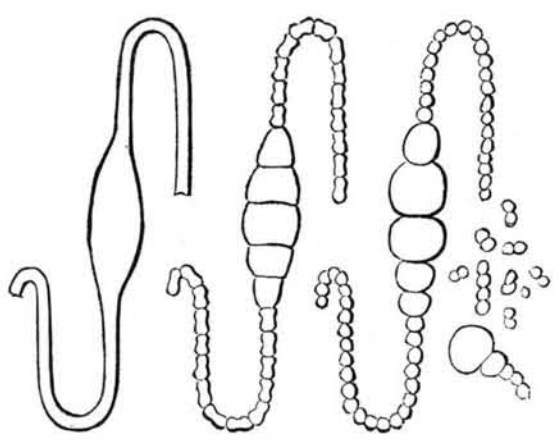

Fig. 11.

The determination, among these myriads of schizophytes of the air and water, as to which are the ones that intervene in contagious diseases is the final problem proposed to science, and the solution of which will be greatly aided by the work that is being done at the observatory under consideration.—*Le Genie Civil.*

A CORRESPONDENT of the *British Medical Journal* states that he has found the application of a strong solution of chromic acid three or four times, by means of a camel's hair pencil, to be the most efficient and easy method of removing warts. They become black and soon fall off.

FIRE AND BURGLAR PROOF SAFES.

The series of nine engravings on the first page are illustrations from sketches of the fire proof and burglar proof safe manufactory of Hollar's Safe and Lock Company, York, Pa. One of the views represents their factory, which was recently built and equipped with machinery and appliances specially designed for their business, and is not excelled by any other establishment for completeness of tools, fittings, and means of producing good work with facility and dispatch. The company have a frontage of 350 feet on the N. C. R. R., from which sidings run to the shops, enabling them to receive supplies direct and to ship finished work with the least possible delay.

The largest of the interior views represents the burglar proof department, so called, because that in it burglar proof safes and vaults are made. Many who are not fully informed on the subject believe that there is no possibility of constructing a burglar proof safe or vault, the belief being induced by published accounts of successful "crackings" of safes by professional burglars. It is probable, however, that investigation would show that the fault lies with those purchasers of safes who regard the price of the safe as of more consequence than its quality, and so encourage the manufacture of inferior and unreliable articles. These ideas would be modified and corrected by a visit to this factory and an inspection of the processes there employed to construct absolutely burglar proof safes and vaults.

These processes are the forming of solid welded angles and frames out of welded plates of chrome and carbon steel and iron; the thorough fitting of all joints by planing and grinding; the exactness of the preparation of the parts for the reception of the company's patented compound key wedges and conical and stub bolts for securing all the parts together as one body; the protection against the introduction of all explosives by the use of their patent ribbed tongues and grooves; the security of the door against the force of the most skillfully driven wedge; the means employed by the company for resisting screw power by their patented method of locking the bolt frames to the door, making it a part of the complete construction; the making, grinding, and building-in their patent lock arbor, that strengthens instead of weakens the door, which has heretofore been the weakest part of the construction. These methods, and intelligent effort in their application, have made it possible to construct a safe with no weak point, the door, always heretofore a point of weakness, being made equally invulnerable with all other portions of the safe or vault.

The facilities for heating, working, hardening, and tempering of steel are excellent. These processes may be seen in the view of the smiths' department, in which large furnaces, bending clamps, and cooling tanks are provided. The tanks are kept constantly supplied with cold, soft water procured from an artesian well, drilled for the purpose; and after all the various parts of the steel safe, vault, or section are completed, they are here treated to the tempering process that renders them proof against the drill or any known cutting device. Then follows the rebuilding of the safe, vault, or section, as the case may be, not again to be taken apart.

In another view is seen the department for the construction of the iron work essential in the production of the highest grade of fire-proof safes. In this department nothing is left undone that will aid to the desired end—that of absolute protection of records, books, papers, plate, jewelry, etc., from fire; for without a strong iron exterior and interior case to contain it and hold it securely, the best non-conducting material is useless. This has been demonstrated by many fires, in which strap or hoop front and back safes have been broken open by falling from a considerable height, or crushed by the weight of falling walls. In order to remedy this fatal weakness this company have introduced, in the construction of their fire-proof safes, solid welded angle fronts and backs, the doors being protected by a wrought iron tongue, which is made to fit neatly into a corresponding groove in the door jamb on all sides.

In the center view is seen the final process of grinding the surfaces of the safes, with traversing emery wheels, as they progress to the filling room, shown in the view to the right. In this room the important process of preparing and mixing the fire-resisting materials is performed. Filled with this substance the hottest fire can never force its heat through the walls of the safe to the injury of the contents. This material is mixed with fifty per cent of water, and thus mixed has the quality of rapidly attaining the solidity of stone with its burden of water sealed within it, ready, in case of fire, to be liberated in the form of vapor, which, pervading the whole interior, prevents the destruction of the contents of the safe.

During the process of fire-proofing an expert examines every part of the work and all the materials used, before the safe is approved and declared ready for the reception of the cabinet work, which is prepared in another department shown in a view on the right. The safe is then ready for the paint-room, seen in another view. Here it receives treatment at the hands of a competent artist, and when finished may be justly pronounced a thing of security and beauty.

The company have a capacity of twenty complete safes a day besides jail and other work. Only the best of materials and the best of workmanship are used and employed—the company make no claim to cheap, second-class work. The most skillful workmen are employed, having been gathered from those localities where the best grade of safe work has been hitherto produced.

Mr. William H. Hollar, the founder and able president and manager of the company, is a gentleman well qualified for the responsible position he occupies, having had years of experience in the business and fully understanding all its requirements. He has able assistants in every department, and a number of the directors and principal stockholders represent much of the wealth and enterprise of a progressive and important community.

RECENT DECISIONS RELATING TO PATENTS.

By the Supreme Court of the United States.

Reissue Letters Patent No. 6,673 granted to Mrs. P. Duff, E. A. Kitzmiller, and R. P. Duff, October 5, 1875, for an improvement in washboards, on the surrender of original letters patent No. 111,585, granted to Westly Todd, as inventor, February 7, 1871, are not infringed by a washboard constructed in accordance with the description contained in letters patent No. 171,568, granted to Aaron J. Hull, December 28, 1875.

In view of prior inventions, the claims of the Todd patent must be limited to the form shown—namely, projections bounded by crossing horizontal and vertical grooves—and do not cover diamond-shaped projections bounded by crossing diagonal grooves.

In the field of washboards made of sheet metal, with the surface broken into protuberances formed of the body of the metal, so as to make a rasping surface and to strengthen the metal by its shape, and to provide channels for the water to run off, Todd was not a pioneer, but merely devised a new form to accomplish those results; and his patent does not cover a form which is a substantial departure from his.

Letters patent granted to Edwin L. Brady, December 17, 1867, for an improved dredge boat for excavating rivers, declared to be invalid for want of novelty and invention.

The design of the patent laws is to reward those who make some substantial discovery or invention which adds to our knowledge and makes a step in advance in the useful arts. It was never their object to grant a monopoly for every trifling device, every shadow of a shade of an idea, which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary progress of manufactures.

Although a patent is not set up by way of defense in an answer, yet if the invention patented thereby is afterward put into actual use, the date of the patent will be evidence of the date of the invention on a question of priority between different parties.

One person receiving from another a full and accurate description of a useful improvement cannot appropriate it to himself, and a patent obtained by him therefore will be void.

By the Court of Claims of the United States.

The language of the Constitution confers upon Congress the power of "securing to inventors the exclusive right to their discoveries." It is not empowered to grant to inventors a favor, but to secure to them a right; and the term "to secure a right" by no possible implication carries with it the opposite power of destroying the right, in whole or in part, by appropriating it to the purposes of the Government, without complying with that other condition of the Constitution, the making of "just compensation."

Neither does the term "the exclusive right" admit of an implication that, with regard to such patentable articles as the Government may need, the right shall not be exclusive.

Such right, when properly secured in the manner provided by law, becomes property in the eye of the law, and the Government cannot make use of the improvement any more than a private individual without license of the inventor or making him compensation.

Where, as in this case, there is clearly an implied contract between the Government and the citizen, and the suit is brought entirely upon that agreement, and the claimant is without judicial redress elsewhere, the Court of Claims of the United States has exclusive jurisdiction.

The above decision has been confirmed by the Supreme Court of the United States.

By various Circuit Courts of the United States.

A licensee is at liberty to contest the question whether the articles made by him embody the invention or any material part thereof, and a stipulation to the contrary in the contract is of no effect.

In a suit by a patentee against a licensee for license fees for the use of a patented improvement, something corresponding to an eviction of the licensee must be pleaded and proved if he would defend against an action for royalties.

Where plaintiff's claim must be construed as a "shortened vamp"—that is, a vamp which ends substantially where the box toe begins—as a means of uniting the box-toe and tip to the upper, and defendant's vamp is carried for the full length over the toe and lasted with the sole, *Held* that there was no use of plaintiff's invention.

A mere license to make and use, without the right to grant to others to make and use, the thing patented, though exclusive, will not authorize the licensee to bring suit in his own name for infringement without joining the patentee. *Semble*, if the patentee refuses to join, a court of equity can give a remedy to the licensee.

Where a manufacturing company and a firm entered into a contract by which the former let out to the latter all the power, machinery, etc., of the company, to be used for the manufacture of tools, and for carrying on the business of

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the company agreed to be done by the latter parties in co-operation with the directors, the firm agreeing to pay as rent ten per cent of their net sales, the profits of the consolidated company to be shared in certain proportions, *Held*, that the manufacturing company are not responsible for the manufacture of try-squares complained of, made by the firm for its own use in the rented premises.

May a landlord be enjoined from permitting his tools and machinery to be used for the injury of a third person? *Quære.*

An improvement in try squares which produces a tool more convenient, with a larger capacity, and more accurate, by adding to such a tool a slot in one of the arms, is a patentable invention.

Whether a reissue is wholly valid or not, it may be valid to the extent that claims in the original and in the reissue are alike; and if those claims are infringed, an injunction may be granted.

The reissued patent of John Lovatt, May 30, 1876, being much broader than the original, declared void.

The right to have corrections made by reissue may be abandoned and lost by unreasonable delay.

A reissued patent which enlarges an original patent—*i. e.*, which makes the invention patented other and more inclusive than the original letters patent—is void as against intervening rights and the public as well.

The object of the law on the subject of patents is to advance the interest of the public by securing certain exclusive rights to patentees, and among those rights is that of changing, by a surrender or reissue, the language when the idea remains the same.

Reissued Letters Patent No. 8,590, granted February 18, 1879, to Charles T. Day, for an improvement in skates, construed and *Held* not to be anticipated by the invention patented June 22, 1869, by Alpheus S. Hunter.

Reissued Letters Patent No. 6,811, granted to John Parker, December 21, 1875, for an improvement in fly-traps, examined and held to be invalid. Reissued Letters Patent No. 6,493, granted to James M. Harper, June 22, 1875, for an improvement in fly-traps, construed and *Held* not to be infringed by the defendant's structure.

In the fly-trap whose construction is otherwise old it is not a patentable invention to strengthen the wire-cloth case by the use of upright and horizontal stays, nor to similarly strengthen the wire cone by annular and upright stays. These are suggestions which would occur to any skilled mechanic in constructing such chambers of wire-cloth, from the very nature of the material, and are mere matters of workmanship involving no invention.

There is no patentable invention in fastening the cone of a fly-trap to the base by slipping the horizontal annular stay of the former within that of the latter, so that they shall coincide, nor in nesting such cones for transportation.

The damages recovered in a suit for infringement are merely a satisfaction for prior use, and do not free the parties infringing from the operation of a patent.

The use of part of an invention covered by a patent may constitute an infringement, and a party so using an invention after injunction granted adjudged guilty of contempt.

Where skates containing an improvement on an earlier patent held by the same inventor were in use or were offered for sale by the same inventor, whether actually sold or not, more than two years before his application for his second or subordinate patent, the latter is void.

The decision of the Patent Office upon an interference proceeding is sufficient to entitle the successful party, as against the defeated party or his privies, to a preliminary injunction upon the question of priority of invention.

The defeated party may, in another action, raise the question of want of novelty in the invention; yet if he had knowledge of the state of the art at the time he made his application, the want of novelty must be made clearly apparent.

Letters Patent No. 259,597, granted to Stephen N. Smith, June 13, 1882, for an improvement in machines for making lacing-hooks for shoes, construed and *Held* not to be anticipated by Letters Patent No. 102,195, granted April 19, 1870, to S. W. Young, or by Reissued Letters Patent No. 9,837, to Lauriston Towne, August 9, 1881.

Letters Patent No. 177,334, granted to Abner B. Hutchins, May 16, 1876, for an improvement in hydrocarbon-stoves, examined. The court declined to consider whether the invention was sufficiently described in a prior Canadian patent, or whether the invention had been in public use for more than two years prior to filing the application, it appearing that the defendants' structure did not infringe the claim of the patent.

Disclaimers, qualifications, and limitations imposed upon a patentee by the Patent Office are forever binding upon him, if he chooses to accept a patent containing them, and they forbid any subsequent enlargement, whether by reissue or by a broad construction of claims thus intended to be limited.

If an applicant considers a case important enough, he may refuse to take a limited patent, and being then rejected, may apply to the Supreme Court of the District of Columbia, and if still dissatisfied, he has his remedy in equity by section 4,515 Revised Statutes. Here remedies are ample, and they are exclusive under the decisions.

Construing the patent according to the requirements of the Office acquiesced in by the patentee, *Held* that the defendant did not infringe, because his frame has not the peculiar construction which the Examiner declared was the only ground for issuing the patent.

Correspondence.

The Statue of Liberty.

To the Editor of the Scientific American:

In your last number is a plan that must meet the approval of all concerned to raise the statue of Liberty, by building it on its great plinth stone; and by powerful screws raising it by degrees to its desired height. But the almost brick-work like pedestal seems out of proportion in its plainness to the statue.

It seems to me that a column, not unlike Pompey's pillar, in Egypt, or a minaret tower, might be designed, that would be far more beautiful, or even some square Italian tower. If the design, in the poverty of the people of the United States, is to build this rude, unseemly pedestal, to be inclosed hereafter in cut and ornamental stone, then there is no objection to it; for it will remind our citizens of the great want of money, that built up so many millionaires. Of course other means of giving the statue stability might be adopted than the central metallic tube, as the statue is evidently designed to be fitted with braced work of metal, and then filled with masonry, with a winding stone staircase to its top. But the mode of its elevation by the plan suggested, it seems to me, is eminently practical.

S. J. PARKER.

Ithaca, N. Y., May 25, 1883.

"Hydrophobia."

To the Editor of the Scientific American:

Working as a boy in the office of the *American Farmer*, Baltimore, Md., I first became familiar with your paper a quarter of a century ago, and it has afforded me boundless pleasure and profit since. In your issue of March 31, article entitled "Treatment for Snake Bites and Hydrophobia," credited to the *Lancet*, I find the following, and if permitted expect to show another illustration of the old adage, "There is no new thing under the sun:" "At a recent meeting of the Lower Rhenish Philosophical and Medical Association, held at Bonn, Professor Binz described an interesting series of experiments carried on under his direction, with a view of testing various antidotes to the poison of serpents. He remarked that numerous specifics are heard of among the natives of India, which as a rule were inoperative. His opinion was that when a poisonous snake has bitten a person in the usual manner, spirits can only serve to alleviate or prevent the spasms of suffocation which are induced by the action of the poison on the respiratory nerves. Atropine and other specifics against imminent results of an analogous character caused by narcotic influences, have been found ineffective against this deadly virus. The most favorable tests made were with *chloride of lime*, a filtered solution of which was injected into the place where the fatal virus had previously been introduced. In seventeen trials made in succession, the poisoned animal survived without the slightest disturbance of its healthy condition. In five succeeding experiments, when a relatively insufficient dose was administered, or when animals suffering from disease *were operated upon*, the chloride of lime served only to retard the fatal effects of the poison. Binz suggested that the adoption of this treatment in cases of the bites of dogs suffering from rabies might possibly be attended with favorable results, inasmuch as chloride of lime has been shown to have much greater power than any of the caustic substances now usually applied to dog bites, which have been proved to be scarcely if at all effective against the consequences of snake bites."

Chloride of sodium, common table salt, chemically a combination of *chlorine* and sodium, universally used as a condiment and antiseptic, and highly recommended in malarial fevers, has recently come to the front as a remedy for hydrophobia; and the letter upon the subject in the April issue of the *Druggists Circular*, by Dr. Dix, of Shelbyville, Ky., merits the attention of the medical profession as well as laymen.

I have in possession some curious instances of the use of chloride of sodium as an internal remedy for hydrophobia, in Maryland, extending back full half a century. My collection of cases where it has been given internally, added to Dr. Dix's experiments and experience applied to the wound externally, would justify further experiment by students of science, particularly, since in addition to the "chlorine" afforded as a decomposer of the animal virus or poison in the circulation are the well known therapeutic effects of salt entering rapidly into the blood and thrown off by the kidneys, acting upon the bowels, tonic and stimulating to the general system. In teaspoonful doses it is widely used as a household remedy to lessen the rapidity of the circulation and stop the flow of blood. Dr. Dix recommends opium for this purpose; the small amount necessary to produce narcotic effects would make its general use, however good, to some extent dangerous, given under circumstances of intense excitement.

Prof. Binz's suggestion that chloride of lime would be a valuable remedy for the cure of hydrophobia, *applied to the wound*, is not quite "as old as the hills," but old nevertheless. Why it did not occur to him to use it hypodermically and by mouth, and to others also, I cannot understand. It is stimulant and astringent, in the first case helping to raise the vital powers, and in the second case lessening the rapidity of the circulation, and retarding the dissemination of the poison through the economy. If chloride of lime applied to the wound will decompose the veins with which it comes in contact, it is reasonable to assume, that some of it will be absorbed by the vessels and decompose the virus in the circulation. If this is a fair assumption, it is plausible, practicable, and possible to meet the poison within the system and destroy it. To show the antiquity of the remedy, I append the extracts taken from a letter of Dr. Jos. Ennals Muse, of Cambridge, Md., written for the *Cambridge Chronicle*, February 18, 1830:

"With this view and these sentiments I make the communication of a *'fact'* which should be cut out and pasted in every man's parlor. The fact I allude to has been recently ascertained by a French chemist and surgeon, M. Coster, and published in the *American Journal of Science*, conducted by Professor Silliman. This important fact, *'that chlorine has the power to decompose and destroy the deadly poison of the saliva of the mad dog!'* has grown out of chemical philosophy and chemical research, and is of more value than vaccination, or any other discovery which the annals of medicine have recorded; because it furnishes man with a certain prophylactic against the most horrible disaster which is incident to his existence.

"Of the truth of this discovery and the accuracy of the experiments on which the statement is predicated, there can be no doubt, 'it is affirmed,' by the most highly valued medical authority; and M. Gay Lussac has since reported a case of the successful application of the same substance to poison by prussic acid, one of the most active and virulent known in nature; and it will probably be extended to many others. It is astonishing that this substance called, 'chlorine" under the new nomenclature, should have remained so long comparatively at rest. It was discovered by Schle in 1774, and was used many years ago by England, and I believe France, to purify their ships, jails, and hospitals, under the name of 'oxy-muriatic gas.' The principle, too, on which it operated was *then* well understood; and the theory now differs in the present case, chiefly in *terms*. Hydrogen gas is known to constitute, in combination with sulphur, phosphorus, and ammonia, the intolerable smells from putrefying substances; deprived of hydrogen this odor disappears; the analogy was extended to animal effluria; the conclusion was drawn that the abstraction of the hydrogen by means of its affinity for the excess of oxygen in the oxy-muriatic gas would destroy the virus by its decomposition; the result has been satisfactory. The Chloridians view this same oxy-muriatic gas as an elementary substance, and call it 'chlorine' from its green color; this 'chlorine' then performs the part of the oxygen of the 'French theory,' and combining with the hydrogen of the effluvia effects its decomposition, and consequent destruction, in the same manner.

"As many poisons (most probably all animal *poisons*) are known to contain hydrogen, it is a matter of astonishment that analogical induction had not long ago advanced the learned inquiries to the present important discovery, 'that poisons, animal and mineral, constituted in part of hydrogen, as far as experiment has gone, are decomposed and rendered innocent by oxy-muriatic gas, or chlorine, as the respected theorists may please to have it."

"This article (chlorine) is cheap, and should, in conjunction with the mode of using it, be in the possession of every family, because delay will render it abortive. It is prepared and applied in the following manner: Make a strong wash, by dissolving two tablespoonfuls of chloruret of lime in half a pint of water, and instantly and repeatedly bathe the part bitten. The poison will in this way be decomposed. It has proved successful when applied within six hours after the animal has been bitten.

"It may be now proper to say that I have made this communication, because the fact stated is one of recent discovery: and I have made it the more full, connecting with it the *rationale*, that it may obtain the greater confidence with those who, though not conversant with chemical science, yet can appreciate the force of reason in any science; and I have affixed my name, because an anonymous notice of a fact does not necessarily bear with it the verity or responsibility of a name.

"I have the honor to be, sir, Yours, etc.,

"JOSEPH E. MUSE."

Hoping this letter will serve to invite the attention of scientific men to experimental investigations relating to the *internal use* of chloride of sodium and chloride of lime, in addition to the already highly extolled external use of these substances, and that they will prove satisfactory substitutes for the present barbarous and unscientific knife and actual cautery—if the poison is on or near the surface of the wound, these substances will destroy it; if it is absorbed, they *may* extract it or neutralize it; the knife and cautery can do no more on the surface, and nothing but injury if the poison is absorbed.

J. M. WORTHINGTON, M.D.

109 Church Street, Annapolis, Md.

Explosion of a Slag Ball.

The *Ironmonger* relates an account of an accident of an alarming character which recently occurred at South Bank, Middlesborough. Near the railway station, says our London contemporary, is the slag heap of the Cargo Fleet Iron-works. A large slag ball had been taken from one of the furnaces and tipped over the slag heap, when it exploded. Three large pieces of the molten slag fell through the roof of the railway station on to the platform, and several passengers awaiting the train to Middlesborough narrowly escaped being injured.

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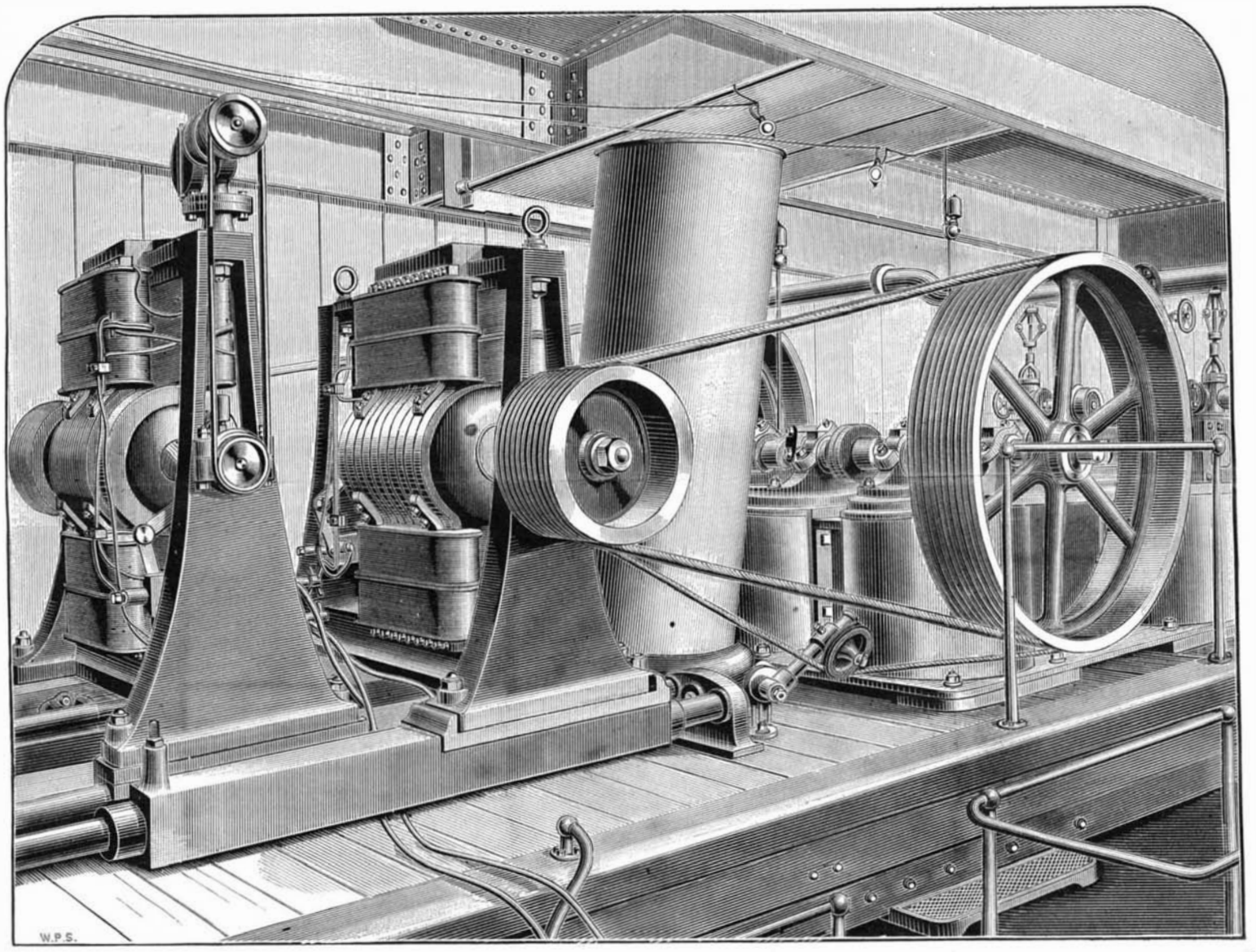
ELECTRIC LIGHTING ON THE ARIZONA.

The progress of electric lighting is well illustrated by the example we herewith illustrate, showing the electrical machinery now in use on board of the fast ocean steamer Arizona, plying between New York and Liverpool. Our engraving and particulars are from *Engineering*.

The Arizona is fitted with two of Siemens' compound shunt wound dynamos, each capable of maintaining 300 high-resistance Swan lamps, driven by a pair of Shanks' "Caledonian" engines, with cylinders 9½ inches by 14 inches. Each dynamo is fixed upon an independent base plate, sliding upon round rods in a foundation plate. The side of the base that takes the strain of the driving rope is lengthened into a long slide, and the two machines are slightly displaced laterally, so that their bases interlock. By means of screws both dynamos may be drawn backward to tighten the belts. There are ten grooves in each flywheel, but there is only one rope to each machine, and consequently but one splice. This necessitates the use of a guide pulley to lead the rope from the last groove of the driven to the first groove of the driving pulley. Only one of the pulleys can be seen in the engraving, the other being hidden by the mast. The axis of one machine is elongated, and is provided with a pulley for driving a tachometer mounted upon the top of the frame. The commutator brushes are set on a bracket, which can be rotated by a worm to bring the points of contact into the most favorable line, and the conductor, which is of large cross section, is jointed, so as not to impede the motion.

By this machinery all parts of the great ship are brilliantly lighted with electric lamps. Looking back for only twelve months, immense advances are to be seen in this department of electric lighting. It is no longer a question with the Liverpool companies in what parts of the ship the light shall be used, for it is now applied everywhere, and both cabin passengers and emigrants share in its benefits. At the present time there are more than a dozen American liners fitted with Siemens generators and Swan lamps, and the number is increasing every month. Besides these there are vessels of the Orient, the Castle, the British India, and other lines, which probably bring the total up to three times that number.



ELECTRIC LIGHT MACHINERY OF STEAMER ARIZONA.

Spontaneous Combustion.

Secretary P. B. Armstrong, of the Mutual Fire, of New York, has sent the following circular to the members of his company, which merits consideration by all who are interested in reducing the number of fires:

Oily Waste.—The frequency of fires from spontaneous combustion is constantly increasing. Only a few years ago this was a debated point between underwriters and business men, but, especially since the introduction of novel products of petroleum and the formation of new chemical compounds, now all observing men admit the power of spontaneity. Chemistry and science are only seemingly arrayed against good underwriting in introducing new agencies of combustion. Pursuant to one of the chief purposes of the Mutual Fire, viz., the prevention of fires, it is appropriate to call the attention of our policyholders to this hazard in its many headed forms, and to adopt such stringent rules and inspections as practically to abolish spontaneous combustion within the risks carried on our books.

Closer attention should be given to the spontaneous origin of fires, although it saves painstaking investigation to ascribe them to incendiarism, and the owner prefers to call the cause "unknown" than to admit his carelessness. In the official reports from the whole State of Massachusetts for 1881, as given by city and town authorities, in the summary of causes of fires, 365 are reported as "unknown," 310 are claimed to be "incendiary," and after "heating," and "lighting apparatus," "spontaneous combustion" leads the list, having created 56 fires. Intelligent observation will in coming years decrease the number of fires called "incendiary" and "unknown," and show that bad management and carelessness are the principal causes of such fires.

The great incendiary to be dreaded is *Oily Waste*, whether in cotton waste, animal fiber, as wool and silk, or vegetable fiber, such as raw cotton, jute, and "Excelsior." In some form it is found everywhere, in private houses and in stores; in shops and factories; at sea and on land; and the higher the mechanical skill and the more costly the product, the more frequent is its existence. Most men have the ready excuse that only a small quantity is used, and therefore it is not dangerous. A handful of cotton waste immersed in a pan of linseed oil is harmless; the same waste with a few drops of oil makes the effort to carry the tiny globules along its fibers by capillary attraction, until it is arrested by the microscopic kinky structures, and especially when under the joint mechanical and chemical action of the sun, combustion spontaneously arises, and another fire is reported as "incendiary."

Rats and mice have great affection for the soft, slightly oily fragments, which they incorporate in their nests, as heedless of the danger of spontaneous combustion as are the more intellectual tenants of the same premises; and in their august assemblies and nightly clubs, they doubtless declaim against incendiarism and the mysterious origin of fires.

In this brief paper it is impracticable to enumerate the particular cases of spontaneous combustion which occur in almost every branch of trade from numerous causes. Two years ago "cordonnet silk" attracted particular attention here, though in England it had been recognized as a special hazard for fifteen years. Phosphorus has recently educated some men concerning its well known powers, and the danger from leaking acids, as used in the electrical batteries stowed away in dusty corners, has been often emphasized by fire-loss.

As even water can be changed into its constituent elements, and transmuted into combustible gases, nothing seems to escape this insidious power of combustion. Unthinkingly, men say iron will not burn, and the proprietor of works which have turned out immense quantities of valuable product for the U. S. Government seemed surprised at the hazard in a pile of damp iron filings, into which had fallen drops of oil and a little cotton waste. In that case only the low temperature of the room or the excess of water had prevented a spontaneous fire.

Common Causes.—The more usual cause of these fires are "oily waste," "rubbing rags," "Excelsior" used for rubbing and finishing, "oiled rags" for cleaning sewing machines, oiled paper used for lining packing cases, iron grindings, piles of coal, etc. The present object is to suggest practical methods for overcoming the danger of spontaneous fires from those principal causes with which we come in daily contact.

Oily waste is the most common cause of spontaneous combustion, since it is found in every factory, store, hotel, office building, etc., having even an elevator in it. The usual custom prevails among the better houses to remove the "oily waste" daily, yet it is quite common to find it lying upon the floors, upon and under workbenches, and often with the clean waste.

"Oily waste" which is permitted to lie around during the day is not likely to be cleaned up carefully at night, and even in the best establishments fragments will fall under machinery, benches, tables, and heating apparatus, besides the surplus carried into rat holes. Then again it is frequently swept up with other rubbish, placed in barrels, and kept over night, to the hazard of property valued at hundreds of thousands of dollars.

Rags used in cleaning sewing machines are commonly placed with the "cuttings," or with the floor sweepings, and repeatedly our inspectors have urged discontinuance of such conduct. Hereafter where such carelessness is discovered and not immediately remedied, our policies will be discontinued without delay.

Novel Railway Propulsion.

A railroad is being constructed from Territet to Glyon, in Switzerland, to be completed next September. The steep mountain side is climbed in a manner similar to the railway up the Riga. The motive power of the Territet and Glyon road is to be water, derived from a reservoir in the hills above Glyon. The use of water in place of coal will not only be a great saving of cost for fuel, but the carriage of fuel up the mountain will be another saving in the running expenses.

Imitation Walnut.

We have it on good authority that an excellent stain for giving light-colored wood the appearance of black walnut may be made and applied as follows: Take Brunswick black, thin it down with turpentine until it is about the right tone and color, and then add about one-twentieth its bulk of varnish. This mixture, it is said, will dry hard and take varnish well.

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THE HELMET CASSOWARY.

The cassowary (Casuarius), of which not less than nine distinct species have been discovered, differs from the emu in having a somewhat more slender body and hair-like feathers. The helmet is quite remarkable, and is composed of a cellular bony substance. It is barely perceptible in the young bird, not reaching its full development until the bird arrives at adult age. The plumage of the body is hair-like, with a tuft of down at the root of each shaft. The short, thick foot has three toes. The height of the bird is about five feet. These birds are found in the Malaccas.

The helmet cassowary (Casuarius galeatus, Struthio casuarius), shown in the engraving, has been the longest known of this family. The plumage is black, the back part of the head green, the neck is colored with blue, violet, and red, the bill is black, and the foot a yellowish gray. The young birds are brown.

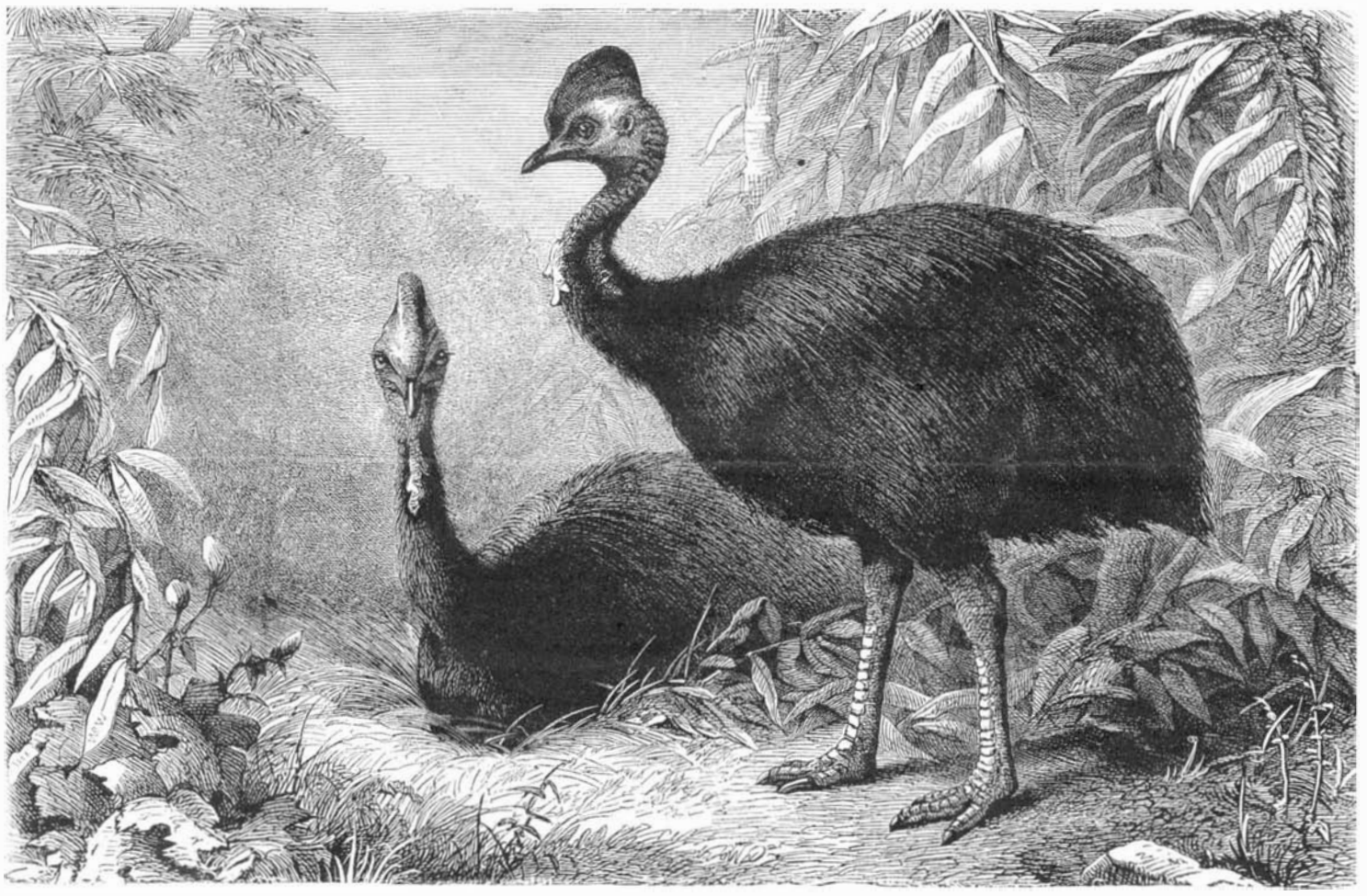
All travelers who tell us of the wild life of this bird agree that it inhabits the thickest forests, and leads a very retired life, and at the least appearance of danger it hastens away, and seeks to withdraw itself from the sight of men. How difficult it is to observe them may be seen from the fact that Miller never had the opportunity of seeing a cassowary, although he found their tracks and heard the noise of the bird fleeing through the thicket, and Wallace in Ceram could not make a single capture, although he sought for the bird in all its accustomed haunts. He says: "These birds wander through the great mountain forests of Ceram, and subsist chiefly on fallen fruits and herbage. The female lays from three to five large beautifully granulated green eggs, and male and female sit alternately upon them for the space of a month.

All the cassowaries which have been taken to Europe were captured when young by the natives and brought up by them. This is perhaps the reason that many of them are tamed and appear to be gentle and confiding, although their original disposition is the reverse of this. They are naturally fierce, and take offense without any provocation. They are greatly excited by the sight of a scarlet cloth, and have a great antipathy toward ragged or unclean persons, sometimes attacking them.

They sometimes become ungovernable in captivity, and the keepers of zoological gardens say that one cannot be too cautious with the cassowary. "When irritated, they are formidable antagonists, turning rapidly about and launching a shower of kicks, which may do no small damage, their effect being heightened by the sharp claws with which the toes are armed." In confinement they often swallow whole apples and oranges. In the gardens they are given a mixture of bread, grain, cut up apples, etc., but it has been observed that young fowls or owls which come accidentally in their way are destroyed.

They often lay eggs in captivity, but it is very seldom that any young are raised. It is not often that a pair can be obtained that will live together in peace.

Another species of cassowary was discovered in the island of New Britain. Its native title is mooruk. A pair of these birds were purchased by Dr. Bennett in 1857 from Captain Devlin, and were sent to England. They were very tame, and ran around everywhere in the house and yard without fear. In time they became so obtrusive that they disturbed the servants in their work, for they would crowd through doors left ajar, follow the servants step by step, rummage in all the corners of the kitchen, spring upon the table and chairs, to the great disquiet of the cook. If any one attempted to catch them, they would run quickly around or creep under the furniture, defending themselves vigorously with bill and feet. If left free, they would go back of their own accord to their accustomed dwelling place. Sometimes, when the maid attempted to drive them away, they would strike out at her and tear her clothes. They would run into the stall between the horses and eat with them from the manger. Often they would push open the door of Dr. Bennett's study, run quietly around, look at everything, and go their way. Dr. Bennett says: "It was dangerous to leave any object around which was capable of being swallowed. The servant was starching some muslin cuffs, and hearing the bell ring she squeezed up the cuff, threw it into the starch, and attended to the summons. On her return the cuff was gone, and she discovered that the mooruk was the thief, its beak and head being covered with the starch. This occurred at eleven A. M., and at half past five P. M. the cuff was passed quite undigested and uninjured." The height of this bird is about five feet when standing erect.—*From Brehm's Animal Life.*



THE HELMET CASSOWARY.

Are Trichinæ Killed by Salt?

The prohibition of the importation of American pork by the German Government, on account of the alleged presence of the microscopic worm known as trichinæ, has awakened a large degree of interest among pork raisers and shippers in this country. That trichinæ are sometimes found in pork (and in some other food flesh) is not to be doubted. That proper cooking of meats for food destroys them is unquestionable. That all authenticated cases of injury to health arising from the presence of this microscopic worm were traced to the eating of uncooked or half raw meat is a fact. But that the salting of meat destroyed the parasite is still a matter of doubt, or, at least, it is a subject of dispute.

On this point United States Consul John Wilson, stationed at Brussels, makes some statements, based on his own observations. He says:

"I have myself been present when officially appointed microscopists at some of the abattoirs of this country have been engaged in examining American pork for trichinæ, and have been invited by these gentlemen to see for myself, through their microscopes, the peculiar cell and spiral coil of the animal; but on carefully examining them I have only observed, blended with the tissue and minute salt crystals, the entombed animal, evidently as destitute of life as the structure in which it was embedded.

"It is claimed by most trichinic observers that the process of generation and birth of this little animal invariably takes place in the stomach and intestinal canal, and that within a few days from its birth it has so matured as to penetrate the walls of the intestines and rapidly make its way through the various intervening structures to the remote muscular tissue of the animal it infects, there to be speedily encysted and endowed with a subsequent dormant existence of several years, during which time its presence occasions little or no inconvenience. Of this theory of the life and movements of this little worm I can only say that it involves an almost unparalleled exception to the law generally regarded as determining animal life, and ought not to be accepted but upon the most positive proof. The law governing parasitic existence in living tissue usually involves the speedy death of the parasite after the pabulum upon which it feeds has passed from under the domain of vital force; hence, unless this tiny worm constitutes an exception to this law, its life must be short after the organic structure upon which it feeds has ceased to live."

Consul Wilson very pertinently adds that "if salt really kills trichinæ, and of it I have scarcely a doubt, it is evidently an injustice on the part of foreign governments to lay an embargo on our pork product, which, of all others, in order to secure it against decomposition on a long journey to foreign markets, is better salted than that of any other country."

The Medicinal Value of Vegetables.

On the authority of the *Medical Record*, asparagus is a strong diuretic, and forms part of the cure for rheumatic patients at such health resorts as Aix-les-Bains. Sorrel is cooling, and forms the staple of that *soupe aux herbes* which a French lady will order for herself after a long and tiring journey. Carrots, as containing a quantity of sugar, are avoided by some people, while others complain of them as indigestible. With regard to the latter accusation, it may be remarked, in passing, that it is the yellow core of the carrot that is difficult of digestion—the outer, a red layer, is tender enough.

In Savoy the peasants have recourse to an infusion of carrots as a specific for jaundice. The large sweet onion is very rich in those alkaline elements which counteract the poison of rheumatic gout. If slowly stewed in weak broth, and eaten with a little Nepaul pepper, it will be found to be an admirable article of diet for patients of studious and sedentary habits. The stalks of cauliflower have the same sort of value, only too often the stalk of a cauliflower is so ill-boiled and unpalatable that few persons would thank you for proposing to them to make part of their meal consist of so uninviting an article.

Turnips, in the same way, are often thought to be indigestible, and better suited for cows and sheep than for delicate people; but here the fault lies with the cook quite as much as with the root. The cook boils the turnips badly, and then pours some butter over it, and the eater of such a dish is sure to be the worst for it. Try a better way. What shall be said about our lettuces? The plant has a slight narcotic action, of which a French old woman, like a French doctor, well knows the value, and when properly cooked is really very easy of digestion.

A Picture in the Heart of an Oak.

A correspondent of the Waterbury (Conn.) *American*, writing from Watertown, says that Mr. Benjamin Marvin, of that town, in splitting a log of black oak, observed a picture on the smooth grain in the heart of the tree. It is a landscape, or rather a clump of trees, with trunk and branches and twigs as clearly defined as though drawn with ink or photographed by the sun's rays. The trees form a picture about four inches square, showing like the open leaf of a book, and the same on the opposite page. Mr. Marvin says it is a pretty good portraiture of the clump of trees which he felled, the picture appearing in the heart of the largest one.

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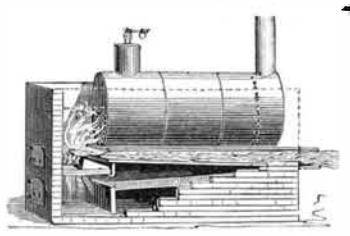
RECENT INVENTIONS.

Bagasse Furnace.

The engraving shows a furnace in which green bagasse may be burned as fuel in the manufacture of sugar and molasses in localities where fuel is scarce and expensive. The invention consists of a chute or chutes contrived, in connection with the furnace, for feeding the fuel along where it is exposed to the heat of the furnace or the flue leading therefrom to the chimney a suitable distance, and for a length of time enabling the fuel to dry and heat, so that it will burn with good results when it finally discharges into the furnace. In evaporating and other furnaces the inventor proposes to arrange the chute to enter the furnace from the back, where the fuel will have the benefit of the whole length of the run of the flame under the evaporating pans from the furnace to the chimney. This invention has been patented by Mr. John Hill, of Independence, Kan. (Box 224).

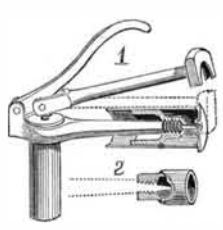


Fruit Picker.

We give an engraving of a very simple and effective fruit picker recently patented by Mr. Lebbeus Simkins, of Marshfield, Oregon. The invention consists of a tube having at its upper end two hollow hemispherical cups, one fixed to an arm projecting from the tube, the other secured to a lever pivoted to the tube and having its shorter arm pivoted to a rod extending down the tube and connected with a hand lever, by which the movable hemispheres are brought together upon the fruit to be picked. A spring attached to the upper end of the rod separates the movable hemisphere from the fixed one when the hand lever is released. With this implement fruit may be picked from the outer and top limbs of a tree, where it could not be reached from a ladder or from the tree, and lowered to the ground or into a basket without being injured.

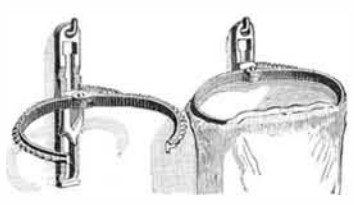
New Cartridge Implement.

The engraving shows a new instrument for capping, loading, and extracting shells, also for removing the caps from the shells. The instrument is composed mainly of three parts, an arm, a handle jointed to the rear end of the arm, and an auxiliary arm, jointed to the handle near its pivot. The main arm is apertured near the pivot of the handle for receiving the body of the cartridge shell, and the handle has an anvil above the center of the apertured portion of the main arm, so that when a shell is passed through the aperture with its flange resting upon the upper side of the arm, the primer or cap can be forced into the shell by means of the handle and its anvil as shown in Fig. 1. Upon the end of the auxiliary arm is a perforated or semicircular flange, made with a groove for receiving the flange of the shell for the purpose of extracting the shell from the gun. Upon the end of the main arm is a pin, and the arm is also screw threaded for receiving a hollow block which is used as a rammer for loading the shell, and also as a guide for decapping. This invention has been patented by Mr. Edmund R. Darling, of Woonsocket, R. I.



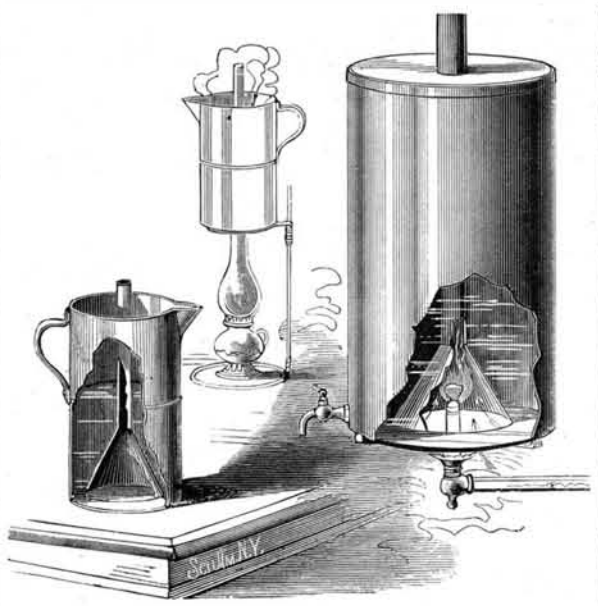
Improved Bag Holder.

The engraving shows an improved device for holding bags while being filled. A cast iron frame is secured in a vertical position to the wall or other support by means of screws, nails, or other convenient fastening. This frame is formed upon its front face and upper edge with the notches, and is formed with the inwardly projecting flanges with which the T-stud of the sliding head is adapted to engage for locking the head and frame together, and at the upper end of the frame these flanges are cut away, so that the head may be attached to and detached from the frame. The sliding head, besides being formed with the T-stud at the back, is formed also with the lip near its lower end, that is adapted to rest in the notches of the frame. Upon the upper end of the sliding head there is a stud which is squared at its lower end as shown, and round at the upper end. Upon the squared portion of the stud is fitted one of the curved arms, and upon the round portion is placed the other curved arm; this arm is normally held back away or open from the other arm by a coiled spring. In use the movable arm will be drawn forward toward the fixed arm and held while the open end of the bag to be filled is placed over or upon the arms. The movable arm will then be released, when the spring will draw it back, and thus hold the bag upon the arms and hold the upper end of the bag open. The sliding head will then be raised in the frame to suit the length of the bag. The edges of the arms are notched or serrated to insure firm hold on the bag. The device constructed in this manner is very cheap, durable, easily handled, and may be adjusted to bags of various sizes and lengths, so that it is perfectly practical for its purpose. This invention has been patented by Mr. E. E. Alderman, of Portville, N. Y.



Benson's Culinary Heater.

This invention is a combination of a cylindrical vessel and an inverted funnel. It is intended for boiling and keeping hot, water and other fluids by means of a gas or oil lamp, the flame of which is introduced into the funnel, and thus utilizing nearly all the heat. This device will be found very useful to restaurant-keepers, barkeepers, barbers, and others who wish to keep hot water constantly on hand. A small article made in this way is useful for shaving and other toilet purposes. It will be a very great convenience in the sick room and nursery.



This device may either be used as a cup or as a funnel. To dealers in liquids this combination will be valuable.

The engraving shows the heater applied to a gas burner, also to a kerosene lamp.

For further particulars, address the patentee, Dr. W. H. Benson, Staunton, Va.

Man's Invisible Foes.

The most indifferent and self-confident man, to whom sickness and disease are merely matters of speculation or curious inquiry, would feel his courage, like Bob Acre's, "ooze out at the end of his fingers" should he meet Dr. Burrill's summary of the bacteria, those minute organisms, one twenty-five thousandth of an inch in diameter, which swarm through the air, infest decomposing materials, and which might, under the most favorable conditions, multiply at the rate of three hundred billions in forty-eight hours from one individual. Dr. Burrill's discussion of the bacteria is interesting, though not especially striking in any new information it imparts, but the synopsis of genera and catalogue of species with which it concludes is quite valuable to workers in protistic life. Thirteen well defined genera and two doubtful genera are enumerated, and their characters briefly stated are as follows:

Micrococcus. Cells globular or oval elliptical, motionless, isolated or united in chains. These embrace pigment forming micrococci, 7 species; ferments, 4 species; disease germs, 11 species; doubtful species, 10.

Ascococcus. Cells globular in irregular groups, often lobed and enveloped by a capsule of firm jelly; this genus contains one species.

Cohnia. Cells globular, inclosed in a jelly-like sac more or less spherical, the walls at last breaking up in net-like openings. It includes one species found in swamps, on decomposing algæ, etc.

Sarcina. Cells globular, dividing in two or three directions, secondary cells small, joined in solid or tabular families in fours or multiples of four. The genus embraces five species.

Bacterium. Cells short cylindrical or long elliptical, rapidly moving much as micrococcus; 14 species.

Bacillus. Cells elongated, attached in rod-like rows or threads, also forming chains; 10 species.

Leptothrix. Very long, slender unbranched threads; 2 species.

Beggiatoa. Filaments very long, slightly or obscurely jointed, moving rapidly; 8 species.

Cladothrix. Like Leptothrix, very slender, colorless, branched, undulating, doubtful; 2 species.

Myconostoc. Filaments slender, colorless, not jointed, embedded in jelly; 1 species.

Spirochæta. Filaments long, very slender, closely wound in places, active; 4 species.

Spiromonas. Cells flattened, spirally twisted; 2 species.

Spirillum. Cells cylindrical, a hair at each end curved or wound; 10 species.

The Saccharomycetes, not included in the foregoing list, are the yeast fungi, and embrace 11 species.

The number of apparently authenticated species is large, but perhaps not so large as the fervid imaginations of students in biology may yet make it. It is to be hoped that the burning zeal which evolves these perplexing forms will be tempered if not quenched by the prudent use of some medical conservatism.

Gas from Iron Cement.

In the construction of a railway bridge over the Forth, a number of cylinders were sunk into the bed of the river. They were built of iron rings 6 feet in diameter and several feet high, and made a total height of 60 feet. The space round the sections was filled up from the inside by a rusting composition of iron turnings mixed with sulphur and sal ammoniac. When wet, this mixture oxidizes and swells up, so as to fill the spaces into which it is thrust. It was applied to the joints by one man. One day last May, however, when there was a perfectly still, somewhat hazy atmosphere, and considerable heat without direct sunshine, this man was observed to become overpowered by some "mysterious influence," and a companion descended by a windlass to bring him up to the top of the cylinder. He managed to get the man into the bucket of the windlass, and so to get him hauled up into purer air; but the deliverer himself succumbed to the same influence, and falling into a pool of water at the bottom of the cylinder was unfortunately drowned. One of the contractors now descended, taking care, however, to fasten a rope to his body, and it was fortunate he did so, as he also succumbed and had to be pulled out by the rope. Dr. Wallace was called in to account for this fatal accident and traced it to the absorption of oxygen by the rusting compound, thus depriving the air in the cylinder of its sustaining power. The oxygen combined with the iron and sulphur of the mixture, and the state of the atmosphere prevented free circulation of fresh air into the cylinder. The result was that the gas breathed by the man was nitrogen, or air robbed of its oxygen. The normal proportion of that gas in the air is 20·9 or 21 per cent, and Dr. Angus Smith has shown that this proportion cannot be altered, even by one-quarter per cent, without producing appreciable effects, while a loss of one-half per cent gives rise to serious inconvenience, and air containing only 20 per cent of oxygen may produce grave consequences if breathed for a considerable time. When the deficiency of oxygen exceeds this to a sensible extent, a candle refuses to burn.

Brilliant Colors for Glass and Porcelain.

BY DR. R. KAYSER.

The pigments commonly employed for decorating glass and porcelain have hitherto been prepared either by melting the metallic salt, which is generally the nitrate, in resin (colophonium), or by decomposing soluble resin soaps with the solutions of these salts, whereby an insoluble resinate is formed, which is first dried and then dissolved, just as that formed by fusion is, in oil of turpentine, or lavender, or in nitrobenzol or some similar solvent.

Both of these methods of preparation have their disadvantages, the principal one being that a considerable quantity of the metallic salt remains undissolved, and when the resinous mass is dissolved it is precipitated and lost, or, at best, is only recovered by a tedious operation.

With the help of carbolic acid these pigments can be prepared without difficulty and without any insoluble metallic compounds separating worth mentioning.

Bismuth.—Ten grains of metallic bismuth are dissolved in aqua regia and evaporated in a porcelain dish to a thin sirup. When cold 50 grammes of carbolic acid liquefied by gently warming in hot water are added. It is left standing a few hours, for if warmed and stirred at once an energetic reaction takes place with violent foaming. At the end of this time it is well stirred with a glass rod and heated awhile in a steam bath, when there will be an evolution of hydrochloric acid vapors. It is taken off the steam bath as soon as a drop taken out on a glass rod will dissolve clear in nitrobenzol. When this point is reached, the mass is dissolved in nitrobenzol or a mixture of nitrobenzol and oil of spike, when the preparation will be ready to use.

Tin.—Ten grammes of pure tin are dissolved in aqua regia and the solution evaporated to a thin sirup, then mixed with 50 grammes of carbolic acid in the manner above described. The remainder of the operation is the same as for bismuth.

Uranium.—Fifteen grammes of nitrate of uranium are mixed with 40 grammes of pure hydrochloric acid and dissolved. This solution is also mixed with 50 grammes of carbolic acid, as before, and treated as already described.

Iron.—Fifteen grammes of perchloride of iron are dissolved in pure hydrochloric acid and any excess removed by evaporation, so the solution when cold will have the consistence of a thin sirup. To this are added 50 grammes of carbolic acid; and it is then treated as described under bismuth.

A manganese pigment can be made from the chloride of manganese; and nickel and cobalt pigments from their chlorides in precisely the same manner as that of iron was made from its chloride.

Of course the finished preparation can be diluted to any desired extent, as the concentration of the original preparation leaves plenty of play for dilution.

The different pigments above described may be mixed with each other to form all kinds of combinations.—*Deut. Ind. Zeitung.*

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ENGINEERING INVENTIONS.

An improved balanced slide valve is the subject of a patent granted to Mr. Jeremiah Murphy, of Brooklyn, N. Y. This invention provides a valve which is balanced by the steam, thus relieving the valve of undue friction and requiring less power for operating the valve.

An improved journal box for car wheels and loose pulleys has been patented by Messrs. George Sargood and F. L. Hemmer, of East Arlington, Vt. This box is air tight, and is so constructed that the bearings may be adjusted as the axle wears away, the air being excluded from the box to prevent the gumming of the oil.

A novel switch lock has been patented by Mr. David H. Speer, of Pittsburg, Pa. This invention relates to locks for securing the lever by which a railroad switch is operated; and consists in a spring-actuated bolt, combined with devices for setting the same in such a manner that it will be tripped by the disengagement of the lever and thrown into position for automatically locking the lever.

A very simple, and we should think effective car coupling has been patented by Messrs. B. W. Harry and J. C. Kieffer, of Milton Center, O. A sliding block is projected by a spring within the aperture in the head block, through which the coupling pin passes. In coupling the cars the connecting link passes into the drawhead, depresses the sliding block, which liberates the link pin, and couples the cars automatically.

A relief valve for steam fire engines to prevent the occurrence of the water hammer and reactionary force of the water when the jet from the hose is suddenly stopped, has been patented by Mr. Richard H. Atwell, of Baltimore, Md. This valve is located in the case which forms a part of the water conduit to the hose, doing away with an extra valve chamber, and it is so arranged as to be opened automatically by the dynamic force of the water.

Mr. Edward Ebi, of Cedar Rapids, Iowa, has patented a novel coupling for brake rods, which is an improvement upon a patent granted to the same inventor October, 1882. The present invention consists of guide blocks loosely mounted on the brake rods, and provided at the outer ends with beveled prongs. These guide blocks guide the clutch disks at the ends of the brake rods together, so that they can engage. The brake rods throughout the whole train are connected, and may be operated simultaneously.

Mr. Clarence C. Delano, of Musson, La., is the inventor of an improved car coupling, which is so constructed that when the cars are to be coupled the pin of the one into which the link is to enter is made to rest on a lever. The link raiser of the car containing the link is then turned so as to raise up the projecting link high enough to enter the socket of the drawbar to which it is to be coupled, and so held until the link enters and trips the pin, thus enabling the cars to be securely coupled.

A railway signal in which a vane, a gong, or ~~other signal is o~~perated by the locomotive at a considerable distance from the signal, is the subject of a patent granted to Mr. W. C. Beckwith, of Norwalk, O. Two air pumps are located at each end of a section of the rail track, and connected together by an air tube. An engine passing over the section in either direction will operate the pump and display the signal, and then conceal it, and the pump first actuated is restored to its normal position by the air pressure.

Another novelty in car couplings has been patented by Mr. J. C. Look, of Yuba City, Cal. The drawhead of the coupling in this instance consists in two horizontal parallel plates connected with one another by studs, each plate being provided with a hook on each side of it over which the grid is passed for coupling the cars. The cars may be uncoupled by a chain which is connected at one end with the grid and at the other with a capstan which is rigged on the top of the car.

An improved rock drilling machine is the subject of a patent granted to Mr. Henry Dunham, of Glen Aubrey, N. Y. The drills are held in position for work by clamps arranged in a row in the lower part of the frame of the machine, and sledges are suspended from an oscillating beam above in such a way that they may be raised and brought forcibly against the ends of the drills for producing the holes in the rock. A pawl and ratchet is provided for rotating the drill at each blow of the sledge. The frame of the machine is mounted upon wheels which move on a track, and it is also provided with cog wheels which mesh with a rack for setting, feeding up, and removing the drills.

An improvement in feed water regulators has been patented by Mr. J. S. Clarke, of East China, Mich. The feed water pipe which connects the pump with the boiler is provided with a waste pipe and a valve, to open the waste pipe when the boiler is full, and to close it and cause the water to enter the boiler when the water begins to fall in the latter. This valve is controlled by a float in the boiler, which float operates a whistle of alarm in case the pump fails to act and the water falls too low in the boiler. The same inventor has more recently obtained another patent for some improvements upon the above invention. These relate, in the first place, to a device for obtaining a uniform pressure both externally and internally upon the float, and to prevent water from entering the same, and further, of a device for relieving the pressure when the main valve is closed, by means of a relief valve which is operated automatically by the main valve. An improved method of working the injector for feeding the boiler is likewise provided.

MECHANICAL INVENTIONS.

Messrs. Geo. B. McCracken and Samuel Hamer, of Willimantic, Conn., have received a patent for improvements in spindle bearings for spinning frames for insuring proper support and lubrication of the spindle without a loss of oil.

A tension device for sewing machines has recently been patented by Mr. Hiram Holden, Jr., of Spencer, Mass., which is intended for use for either wax or dry thread sewing machines, and insures the tightening of the thread in the work and prevents breaking or cutting of the thread.

An improved gear cutter for cutting beveled, straight, spur, and worm gearing has been patented by Messrs. John Brooks and William Scully, of Detroit, Mich. This machine is designed to provide a gear cutter that can be used upon any lathe or upon any machine provided with a pair of centers and a driving pulley.

Mr. D. H. Lord, of Northfield, Minn., has patented a mill stuff recovering machine, by which any surplus meal or dust accumulating in different parts of the mill may be returned to the proper channels for passing to the dressing machinery in a much more satisfactory manner than by the common method of feeding it directly to the elevator by hand.

Mr. Hugh O. Ames, of New Orleans, La., has patented a pan for evaporating cane juice which is an improvement upon a patent granted to Mr. Ames in December, 1880. The object of this improvement is to give the liquid a uniform heat and a steady circulation for the purpose of expediting the process of evaporation and of cleansing the liquid of scum more perfectly than by methods formerly employed.

An improved ice cream freezer has been patented by Mr. Ferdinand Espel, of San Francisco, Cal. The salt is kept from settling at the bottom by changing the horizontal position of the freezer from time to time, so that what was at first the lower part of the freezer will be at the top, and thus cause continual circulation of the salt, greatly expediting the freezing process.

An improved ear corn cutter has been patented by Mr. J. N. Howser, of Sidney, Ill. The object of this invention is to provide a cutter having a yielding gauge to permit the slice to recede as the thickness of the blade parts the corn from the ear. The gauge is made adjustable as to the thickness of the slice to be cut. Means are provided whereby the cut corn shall be turned away from the lower gearing of the machine.

A removable valve cover is the subject of an invention of which Mr. E. E. Carter, of Waynesburg, Pa., is the patentee. The object of this improvement is to provide a valve cover which can be readily taken off and replaced, so as to afford easy access to the valve and its seat, and to the interior parts of the adjacent pipes for convenient inspection and to facilitate the cleansing of the valves and pipes.

A cotton gin of improved construction has been patented by Mr. Thomas Camp, of Covington, Ga. The lower edge of the gin breast is provided with a series of slots adapted to register with the spaces between the ribs, so that the cotton shall be ginned through the slots instead of between the ribs, thus separating the cotton fiber from the seed without matting and napping the fibers.

A very simple but effective device for leveling pendulum clocks has been patented by Mr. R. B. Freeman, of Blossburg, Pa. The clock is provided with an adjustable back to which the works are attached. This supplementary back is changed to any necessary degree to bring the pendulum in plane with the works, so as to insure accuracy of beat without disturbing the position of the clock case.

An improved curd mill has been patented by Messrs. Goswin Castle and George D. Pohl, of Ava, N. Y. This invention consists of an apparatus for grinding curd in cheese factories before it is taken out of the vat and preparatory to putting it in the hoops, and consists of a pair of toothed rollers working together, the teeth being contrived for tearing or breaking up the curd rather than cutting or squeezing it. An attachment is provided for salting the curd while grinding it.

An ejector for the purpose of raising water or other liquids from wells by the means of compressed air has recently been patented by Mr. W. O. Robbins, of New York city. As compressed air is very apt to bubble through liquids without raising them, the inventor provides a series of check valves, so arranged that they cannot pass through the discharge pipe without forcing the air to act on the column of liquid and to raise it.

An improved lifting jack is the subject of a patent granted to Mr. Marcus Eaton, of Circleville, O., which is so constructed that the axle of a light carriage may be elevated, so that both wheels will be raised from the ground at the same time. This jack is especially recommended to the attention of carriage builders, where it is necessary, in painting and varnishing the gearing, that all the wheels of the vehicle should be raised from the floor.

An improved vehicle wheel which the inventor terms a "steel suspension wheel," and designed to be applied to buggies, wagons, bicycles, etc., has been patented by Mr. E. G. Ferguson, of Macon, Ga. The spokes of the wheel are secured in two pairs of disks at the hub. A spiral spring around the hub holds the two sets of disks apart with a yielding strain, to compensate for the expansion and contraction due to variation in temperature.

An ingenious combination lock has been patented by Mr. William B. Atkinson, of Franklin, Ky. The invention consists of a combination lock having a ward wheel in engagement with each side of the bolt, and means for controlling the operation of the tumbler in rotating the ward wheels and moving the bolt, and in certain means for converting the bolt into a spring bolt at will, whereby a very simple lock is provided which is at once durable and inexpensive.

Mr. W. H. Davis, of Verona, Miss., who obtained a patent in May, 1882, for driving machinery especially adapted for cotton gins, mills, etc., has patented recently some improvements on the same. The invention consists in arranging the driving wheel, the counter shaft pulley, the guide pulley, and the sliding frame which carries the guide pulley in such a manner that the driving band will pass squarely upon the counter shaft pulley, economizing space, and avoiding friction.

An improved hoisting device to be employed in elevators for coal, ore, etc., in which a winding drum is used to elevate coal from a vertical shaft by hand by means of bucket and rope, has been patented by Mr. C. W. Baldwin, of Denver, Colo. A reciprocating lever is provided by means of which intermittent motion is communicated to the winding drum in one direction. Devices are also provided for lowering the bucket rapidly into the shaft, and for regulating the descent by a controlling brake.

A flexible fire escape ladder of improved construction has been patented by Mr. Wesley C. Bush, of Brooklyn, N. Y. This improvement consists of two series of links which form the side support of the ladder, and are united by rungs. These links are of metal and are pivoted one to the other in such a manner that the ladder may be wound on a drum in one direction, while it is entirely stiff and inflexible in the other direction. In this way the ladder may be rapidly unrolled and put in position in case of fire.

Mr. G. W. Pittman, of Keokuk, Iowa, is the patentee of an improved bench vise which the inventor claims may be operated more quickly and more easily than those commonly in use. In this vise of Mr. Pittman both large and small objects may be held by the jaws with equal facility and without the necessity of unscrewing and screwing up the jaws, as is the case with vises of the ordinary construction. It is likewise a simply and cheaply constructed implement, and is equally adapted for heavy and light work.

An improved coke furnace and apparatus for the delivery of the coke into cars has been patented by Mr. Richard Thomas, of Carbondale, Ill. The object of the improvement is to provide for the withdrawal of coke from the furnaces in which it is made, and for the loading of the coke into railroad cars, without the use of rakes, forks, or other devices, thereby reducing the labor heretofore required in handling the coke, and saving the waste resulting from such handling. This is an improvement upon a patent granted to the same inventor in November, 1881.

An improved davit and chair for life boats has been patented by Mr. J. H. F. Meyer, of Philadelphia, Pa. The chairs upon which the boat rests, instead of being stationary as is ordinarily the case, are hinged and connected with one another in such a way, that when the boat is to be swung out for use, these chairs are lowered out of the way which obviates the necessity of raising the boat for clearing the chairs. Further, the davits are hinged at their lower ends, so that when the boat is to be lowered, the davits are swung forward, thus bringing the boat into position for clearing the side of the ship. At the same moment the pin which retains the boat in its elevated position is liberated by the swinging of the davit, and the boat being lowered into the water will be automatically released from the ropes by the action of the connecting gear. This so far simplifies the operation of lowering boats at sea, that only one or two men are required for the purpose.

AGRICULTURAL INVENTIONS.

Mr. David Wise, of Paradise, Texas, is the patentee of an improved seed planter, so constructed as to operate automatically by the action of the wheels. A lever is provided by means of which the opening plows may be adjusted to work at any desired depth in the ground, and can be raised from the ground when desired. A foot lever is provided for throwing the gear wheels into and out of gear.

An improved hay stacker which greatly economizes time and labor has been patented by Mr. J. C. Testman, of Wisner, Neb. The machine consists of an inclined way upon which is arranged on wheels a movable frame provided with a series of hook teeth, for grasping the hay at the bottom of the inclined way. The truck with its load is then hauled by a rope and pulleys to the top of the frame, where the hay is discharged, the forks being raised automatically.

MISCELLANEOUS INVENTIONS.

Mr. Henry Hirsh, of New York city, has patented an improved frame or cap for holding pictures or other souvenirs in the case of a watch.

The subject of a patent recently granted to Mr. E. W. Free, of Baltimore, Md., is an attachment for drills for facilitating the spreading of either grain or fertilizers. The attachment is simple and is intended to supply a long felt want.

Mr. Leonard Tilton, of Brooklyn, N. Y., has patented a blind stop which is a cheap, efficient, and easily operated device for holding the slats of window blinds open or closed, or at any desired intermediate position.

An improved compound for preserving belts, keeping them soft and pliable, so that they will lie close to the pulleys, and prevent the slipping of the same, has been patented by Mr. W. H. Durkee, of Cincinnati, O. This mixture consists of tallow, light resin, and castor oil compounded in certain proportions.

Mr. William S. Appleget, of Cranbury, N. J., has obtained a patent for an improved platform gear for wagons which consists in so constructing and combining the several parts, the elliptic springs, the braces, the bars, and the pole with the axle of the wagon that greater firmness and durability is secured.

A combined refrigerator, filter, and water cooler is the subject of a patent granted to Mr. T. C. Nativel, of Brooklyn, Cal., whereby in one apparatus the water may be filtered and kept cool for drinking purposes, and at the same time a sufficient amount of space is provided for keeping butter, meats, etc.

Mr. James H. Russ, of Providence, R. I., has patented an improvement in spring balanced rollers for window shades, which is so constructed that the energy stored up in pulling down the shade will be sufficient for raising it again when necessary. The invention is simple in construction, and provides a shade roller not likely to get out of order.

An improved awning to be attached to the side of a hop box to protect the pickers from the rays of the sun has been patented by Mr. Jacob Engle, Jr., of Sharon Center, N. Y. This consists in a folding sunshade supported on an extension staff, provided with a universal joint, so that the shade may be shifted to any desired angle as the sun's rays change.

Mr. D. W. Wilkins, of Boston, Mass., has patented a device to be applied to shirt bosoms for preventing the screws of spiral studs from irritating the skin and cutting holes in the underwear. This shield consists of two disks secured to each other at the edges, one of which is provided with an aperture through which the screw of the stud is passed.

An improved nut lock has been patented by Mr. G. P. Mlinarich, of Del Rio, Tex. The bolt to which the nut is attached has a longitudinal groove, into which a key slides, and connects with the nut which is so constructed as to prevent it from unscrewing. The inventor intends to have the key made out of a metal which is not liable to rust.

A brake block which acts by friction on the tire of a wheel is the subject of a patent granted to Mr. M. J. Siqueira, of Brooklyn, Cal. This brake block is furnished with a leather strip to receive the friction wear from the wheel. The friction leather is secured by hooks and pins, so that when it is worn out a new one may be substituted without difficulty.

Mr. Charles H. Bennett, of Halifax, Nova Scotia, has recently obtained as assignee a patent on a stencil holder, the invention of J. W. Bennett, of the same place. The object of the improvement is to permit stencil, name, or number plates to be inserted and removed readily, and for holding them firmly while in use, whatever may be the shape of the plate.

Mr. William Standing, of St. Louis, Mo., has patented an improved safety trace holder which is so constructed, that by simply inserting the trace in the holder it will be firmly held by the same, and the greater the pull on the trace the more firmly will it be retained, but should the horse or horses become unmanageable, by pulling a cord the trace will be detached, and the unruly beast will be set at liberty.

A pocket button hook has been patented by Mr. George Clark, of Brooklyn, N. Y. The hook shank slides up and down in the handle, which consists in a hollow flattened metal case. When the hook is not required for use, it is pushed into the handle, and thus will occupy but little space. The implement is intended for pocket use, and will be found quite a convenient article.

An improved hood for electric lamps has been patented by Mr. Samuel H. Tacy, of New York city. This hood consists of a conical upper part having a sleeve at its apex, and the lower part in the form of an inverted cone and hinged suitably to the upper part. The object of the hood is to protect the operating mechanism of the lamp and increase its effectiveness by reflecting the light downward.

A molasses evaporator for concentrating cane juice or other kinds of saccharine juices to form sugar and molasses, has been patented by Mr. J. S. Boren, of Booneville, Miss. The improvement consists in the construction of the box, which is made up of several independent troughs of copper or other metal connected by suitable conduits, the corners at the bottom being round, so that they may be more readily cleaned.

An improved truck designed to facilitate the handling and transporting of bricks has been patented by Mr. J. S. Armstrong, of Republic, O. The platform upon which the bricks are loaded is suspended by rods to the frame of a barrow-like vehicle by means of which they may be wheeled from one spot to another, where they may be deposited without removing them from the platform by detaching the rods from the frame of the truck.

An improved fastener for gloves, shoes, etc., is the subject of a patent granted to Mr. D. T. Chambers, of Washington, D. C. The slit of the gloves is provided with a flap which has a buckle loop attached to one of its edges through which a strap passes for holding down the flap, this strap being attached at the free end to a button located on the back of the glove, making it fit the wrist snugly, and giving the glove an ornamental appearance.

Mr. S. B. Bartine, of Tottenville, N. Y., has obtained a patent for an improved sun shade hat which consists in a hat having a crown, that in hot weather may be raised, furnishing an umbrella-like sunshade protecting the head of the wearer from the rays of the sun, and permitting at the same time a free circulation of air. In cool weather the shade may be collapsed and a hat of the ordinary appearance will be provided.

Mr. John Lutz, of Xenia, O., has patented an improved end gate for wagon boxes. The upper end board is arranged to swing down upon a lower end board, so that the former will rest in an inclined position between side wings which retain the contents of the box. The special advantage of this improvement is that it greatly facilitates the use of a shovel in the removal of the load, and in the case of loads of potatoes, apples, etc., enables the shovel to be inserted underneath the produce without damage to them.

Mr. J. Harris Rogers, of Washington, D. C. is the patentee of an improved automatic telegraph, which consists in a novel arrangement of stylus and indented metal foil or sheet in an automatic telegraph, for the purpose of transmitting electrical impulses by breaking connection over the indentations in the strip or sheet and making contact with the intervening spaces lying in the normal plane of the strip or sheet, in contradistinction to making contact with raised embossments. Devices are provided whereby a message may be transmitted without removing the strip from the carrier, and also for avoiding static charges on the line.

Mr. F. M. White, of Winigan, Mo., is the inventor of a new harness pad press for the use of harness makers for forming and pressing the leather into the proper shape, preparatory to the pad stuffing process. The body of the press is of metal, and is provided with a form or mould over which the leather is stretched. The leather is confined to the form by a metallic hoop, which fits closely around the outer edge of the form, holding the leather securely on all sides, but leaving the central portion free to conform to the mould. The frame may be constructed to hold two or more formers, and thus the manufacture of harness pads is greatly facilitated.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted immediately.—First-class experienced Salesman to sell State rights for a valuable patent. Give terms and particulars. Address F. F. F., Lowell, Mass.

Superintendent wanted for factory near New York. Must understand machine shop, wood shop, foundry, blacksmithing, etc., according to modern customs, and be a man of proved ability. Address, stating experience, expectations, etc., "Wood and Iron," care of William Young, 21 Park Row, New York.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Wanted.—Second-hand Engine, four to six horse power; Baxter preferred. John J. Rosa, Milford, Del.

For Sale Cheap: 4¾ in. Equatorial Telescope, Prisms, Eyepieces, Spectroscope, Micrometer. Dr. T. A. Hoard, Utica, N. Y.

Foreman Blacksmith, Drops, Punches. See adv., p. 269.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

How Consumption may be Prevented and often Cured without Medicine. A Hygienic Lecture mailed for 10 cents. Dr. W. H. Benson, Staunton, Va.

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

American Fruit Drier. Free Pamphlet. See ad., p. 350.

Curtis Pressure Regulator and Steam Trap. See p. 349.

Brass & Copper in sheets, wire & blanks. See ad. p. 350.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 350.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

20,000 Duc Spherical Elevator Buckets, sizes 3½ to 17 inches, constantly on hand. Telegraphic orders filled. T. F. Rowland, sole manufacturer, Brooklyn, N. Y.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Straight Line Engine Co., Syracuse, N. Y. See p. 349.

Lightning Screw Plates, Labor-saving Tools, p. 248.

Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. More than eight hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Metal Patterns,
Punches and Dies to order.
Geo. Van Sands, Middletown, Conn.

Drop Forgings.—Billings & Spencer Co. See adv., p. 316.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 333.

The Sweetland Chuck. See illus. adv., p. 334.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lewis' Combination Force Pump makes three machines made of brass throughout. See Adv. page 317.

Saw Mills, Hauck & Comstock, Mechanicsburg, Pa.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 44 Murray St., N. Y.

See New American File Co.'s Advertisement, p. 302.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 300.

Steam Pumps. See adv. Smith, Vaile & Co., p. 300.

Stenographers, type-writers, clerks, and copyists may be obtained free of charge at the Young Women's Christian Association, 7 East 15th Street, New York.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

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The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Farley's Directories of the Metal Workers, Hardware Trade, and Mines of the United States. Price $3.00 each. Farley, Paul & Baker, 530 Market Street, Phila.

Improved Skinner Portable Engines. Erie, Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Permanent Exposition.—Inventors' Institute, Cooper Union, N.Y. City. Every facility for exhibition of machinery, merchandise, and inventions. The expense is small—the advantages great. Send for particulars.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

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"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
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25" Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

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Recent Advances in Electricity. 170 pp., 8vo., $2. Latest and best book out. School of Electricity, N. Y.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

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For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

NEW BOOKS AND PUBLICATIONS.

DIE MASSENVERHALTNISSE DES MENSCHLICHEN HERZENS. (THE PROPORTIONS OF THE CONSTITUENTS OF THE HUMAN HEART.) By Wilhelm Müller, Director of the Pathological Institute of the University of Jena. Hamburg and Leipsic: Leopold Voss, 1883. 220 pages.

The author examined 1481 hearts during the five years from 1877 to 1881, and tabulated the results obtained, with the greatest care. He gives tables of the length, the absolute weight, and the proportionate weight of each heart, the age of the person from whom the heart was taken, and the main cause of death. The work is of especial interest to medical students.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) E. A. B.—The impurities commonly found in rock salt are generally of an earthy, sandy, or ferruginous-ocherous nature. These it is impossible to separate from the dry salt by known mechanical means, but if the substance is liquefied the separation becomes a comparatively easy matter. As commonly practiced the operation of refining is as follows: The native salt is shoveled into a series of large cisterns or wooden vats arranged so that water entering the first will gradually overflow into the next and so on to the last (five vats are the usual number). Water (pure) is allowed to enter slowly into the first reservoir at or near its bottom and percolate upward through the broken salt rock. An overflow tube near the top of the vessel carries off the resulting salt solution to the next cistern or vat. If these cisterns or vats are kept well filled with the broken rock salt, the liquid flowing from the last of the series will be a saturated solution of salt. This is drawn off into large tubs or cisterns and allowed to stand for three hours to deposit the impurities. The clear liquid is then run into shallow pans and allowed to evaporate and crystallize by contact with dry air, or is first concentrated by boiling down in large caldrons seated on a furnace. In another plan of concentration lately developed the solution is caused to flow slowly downward over a series of pipes heated by circulation of steam under pressure within them.

(2) M. M. H.—One of the simplest methods of recovering silver from waste solutions is the following: First dilute the liquid about one-third with water (double this quantity if much gum is present), heat the solution to about 180° Fah., and gradually add solution of pure sulphate of iron (iron sulphate 5 ounces, water 1 pint) until no further precipitate forms. Decant the liquid portion, throw the precipitate on a filter, and wash it thoroughly with hot water. To the washed precipitate—consisting of finely divided metallic silver—add strong pure nitric acid and heat over a water bath until the silver has all been dissolved. Evaporate to dryness over the water bath (in a porcelain dish, capsule) and dissolve the residue in hot water (distilled or rain). Filter this solution and concentrate it over a water bath, then set it aside to crystallize. Remove the crystals, concentrate in a similar manner the mother liquid, and obtain another crop of crystals. These crystals (of nitrate of silver) are pure enough for ordinary purposes, but if required to be used for photographic purposes they should be redissolved in water and recrystallized. Where the liquid containing the silver contains also much insoluble organic matter, it is sometimes preferable to separate the silver by evaporating the liquid to dryness and fusing the residue with an equal quantity of borax glass in a black lead crucible.

(3) F. A. C. asks: What will be the power of an engine 1⅛ inch bore and 2¼ inch stroke, making 200 revolutions per minute with 40 pounds of steam, common slide valve engine? A. About one-twelfth of one horse power.

(4) E. G. A. writes: I am building a small portable engine, boiler twenty by ten inches and three-sixteenths thick boiler plate. What pressure of steam would be safe, and how may I conveniently test it by hydrostatic pressure? A. If well made, 150 pounds per square inch. 2. What pressure would raise a valve one-fourth inch in diameter, and lever pivoted three-fourths inch from valve stem and 1 pound weight, 4 and 6 inches from valve stem? Also please give me a rule for calculating safety valves, if there be such a rule. A. You can prove by a force pump, and having a proper gauge to show the pressure. Rule for safety valves: Multiplying the area of the valve in inches by the pressure per square inch, gives the total pressure, and that sum divided by the number of "leverages" will give the necessary weight, not taking into account the weight of valve and lever. Do not make your valve less than a half inch diameter.

(5) M. E. S. inquires for information as to tractive force upon macadamized roads. A. Some interesting experiments have recently been made to ascertain the tractive force requisite to move street cars and vehicles on a macadamized road. The apparatus used consisted of an inclined plane, at the upper end of which was an iron wheel, over which passed a rope. A loaded box car weighing, with its contents, 12,820 pounds was drawn up the grade by a weight of 970 pounds, suspended at the other end of the rope. The empty car, weighing 4,820 pounds, was drawn up the same grade by a weight of 283 pounds. A smaller box car, weighing when empty 2,730 pounds, was occupied by fourteen persons, and drawn up by 339 pounds, and when unoccupied by 176 pounds. An ordinary load of sand on a macadamized road was started by 514 pounds, and an empty hack, weighing 1,550 pounds, by 196 pounds. The same hack, with four passengers inside, required 236 pounds to move it. On a level road the load of sand was started by 240 pounds, while the large box car yielded to 56 pounds. These experiments were made by a horse railroad company to prove that their work was not unusually severe for the horses.

(6) P. G. H. asks for a cement for gas retorts. A. For cementing earthenware gas retorts, which have to withstand very high temperatures, the following cement can be used: Powdered glass, 5 parts; chamotte meal, 5; powdered borax, 1. Chamotte meal is obtained by pulverizing broken pieces of gas retorts. This cement is a hard glass, which only melts at the highest temperatures, then closes the leaks in the retort. To render the iron retort cover which closes the retort air tight, a cement is used consisting of schwerspath powder, to which as much soluble glass has been mixed as to obtain a paste of sufficient strength.

(7) S. B. P. asks: Will you give the formula for making a good paste stove polish? A. The following liquid stove polish is recommended:

Pulverized black lead	2 pounds.
Spirits of turpentine	2 gallons.
Water	2 ounces.
Sugar	2 "

Mix.

(8) J. L. B. and J. J. ask for a receipt for taking printing ink out of paper. A. This is not an easy matter. It is said, however, that it can be accomplished to a limited extent by means of ether or a solution of soap in water, naphtha, benzol, hot solutions in water of potassium or sodium hydroxide (caustic potash or soda).

(9) J. H. asks how to erase scratches made by amalgam on vulcanized black rubber plate and cylinder friction electric machines. How are the plates polished to keep from fouling by amalgam? A. The best way to prevent the scratches is by making the amalgam very fine and to apply it with tallow. Scratches made on glass cannot be removed except by grinding the glass, which is more expensive than purchasing new glasses. The rubber plates would have to be repolished.

(10) J. S. D. asks (1) how to make liquid glass or as it is sometimes called water glass. Will it solidify when in bulk, and if so in what is it soluble? A. The alkaline silicates are prepared by pressing silica with the hydrates, carbonates, nitrates, or other salts of the alkali, metals containing volatile acids or by boiling flint, sand, etc., in with strong solutions of the caustic alkalies under pressure. For full details see SCIENTIFIC AMERICAN SUPPLEMENT, page 5061, No. 317. 2. How can I make a night light with sweet oil and phosphorus? Is anything necessary, and should the vessel containing them be kept air tight? A. See answer to query No. 54, current volume, issue for Jan. 13, 1883.

(11) W. A. F.—Chloride of gold is prepared by dissolving gold in nitro muriatic acid, evaporating to dryness, and dissolving the resulting crystals in water. We would recommend you to purchase the chloride of gold. Its manufacture is attended with dangers which in the hands of an inexpert may lead to serious accidents.

(12) W. T. V. asks: 1. What is the best solvent for India rubber gum? A. According to the *British Journal of Photography*, a mixture of methylated ether and petroleum spirit is said to be the best solvent. 2. How is rubber cement made? A. See formulas for cements in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 3. Will pure Para gum answer in place of gutta-percha where the latter is given in a formula for cement? A. It is probable the substitution can be made; however, the Para rubber is more expensive.

(13) J. W. S. writes: I have a cambric balloon which is too porous to retain heated air in order to make it ascend. What can I coat it with to make it air tight, flexible, and at the same time add but little weight to it? A. Apply a varnish made as follows: Melt India-rubber in small pieces with its weight of linseed oil, and thin with spirits of turpentine.

(14) A. D. F. asks: 1. What is the best filling for mahogany, and how made and used? A. Take equal parts by weight of whiting, plaster of Paris, pumice stone, and litharge, to which may be added a little French yellow, asphaltum, Vandyke brown, and terra di Sienna. Mix with 1 part japan, 2 of boiled oil, and 3 of turpentine; grind fine in a mill. Lay the filling in with a brush, rub it in well, let it set 20 minutes, and then rub it clean. 2. What is used to stain or colormahogany and cherry to give them the appearance of age? A. Boil half a pound madder and 2 ounces logwood chips in a gallon of water and brush well over while hot; when dry go over the whole with pearl ash solution, 2 drs. to the quart. 3. What is the process used to photograph on wood for making wood cuts? A. Consult SCIENTIFIC AMERICAN SUPPLEMENT, No. 53. 4. What simple cement or compound will fasten a paper label to glass and not be affected by moisture or be easily removed? A. Starch paste with which a little Venice turpentine has been incorporated while it is warm. 5. Is hyposulphite sodium made in this country? A. It is.

(15) F. J. F. asks: What ingredients are necessary for making ten pounds of roller composition for a printing press? A. Cooper's best glue 8½ pounds, extra sirup 2 gallons, glycerine 1 pint, Venice turpentine 2 ounces. Steep the glue in rain water until pliant, and drain it well. Then melt it over a moderate fire, but do not cook it. This will take from 15 to 25 minutes. Next put in the sirup and boil three-quarters of an hour, stirring it occasionally and skimming off impurities rising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire, and pour slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

(16) C. D. E. asks what preparation awning and tent makers use to prevent their canvas from mildewing. A. Use the following: Alum, 2 pounds dissolved in 60 pounds water; blue vitriol, 2 pounds dissolved in 8 pounds water; to which is added gelatine, 1 pound dissolved in 30 pounds water; lead acetate, half a pound dissolved in 30 pounds water. The solutions are all hot, and separately mixed, with the exception of the vitriol, which is added. See also receipts for waterproofing cloth. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.

(17) W. O. C. asks: 1. How can I clean shells? A. To clean shells: Make a lye by boiling strong ashes, allow it to settle, pour the lye over the shells, and boil them six or seven hours, or longer if they are large; then soak and wash frequently in fresh water. 2. How to glaze pipes without heating. A. As to glaze for pipes, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 226, for varnishes to protect iron.

(18) J. H. writes: Please give me, in your column of Notes and Queries, a good paste or glue for attaching paper labels to stone, Indian relics, geological specimens, etc.

A. Starch	2 drachms.
White sugar	1 ounce.
Gum arabic	2 drachms.
Water	q. s.

Dissolve the gum, add the sugar, and boil until the starch is cooked.

(19) E. P. asks for a receipt for bleaching ivory. A. See article on Hydrogen Peroxide for this purpose, page 5572, SCIENTIFIC AMERICAN SUPPLEMENT, No. 349.

(20) E. P. W. asks: What mixture can be put into paint or on to canvas, before it is painted, to prevent it from absorbing so much paint? A. Size your canvas with rather thin glue size.

(21) B. B. asks: Will you inform me what metal or substance is the most sensitive to heat or cold—that will expand or contract the most? I wish to get something that one or two degrees will affect. A. After mercury, zinc is the metal most sensitive to heat and cold.

(22) K. N. asks: 1. What is the composition of water glass and what its properties? A. Read SCIENTIFIC AMERICAN SUPPLEMENT, No. 317, page 5061. 2. What authorities can I read on the subject? A. See "Watts' Dictionary of Chemistry," under head of Silicates, also "Spons' Encyclopedia of the Industrial Arts," and like technological dictionaries. 3. Is there any combination with which color can be given to glass (stain glass) so as to withstand heat and water without danger? A. Aniline colors dissolved in alcohol can be mixed with water glass. Ordinary glass if treated by the La Bastie process will stand heat and water.

(23) F. A. B. asks how the aniline ink for rubber stamps is made. A. Dissolve crystallized aniline black, half an ounce, in pure alcohol, 15 ounces, and add concentrated glycerine, 15 ounces, to the solution. This liquid is poured upon the cushion and rubbed with a brush.

(24) J. R. M. writes: I am greatly annoyed by a continuous output of soot from my chimney flues, especially the kitchen flue, where I have a portable range attached. My chimneys are all considerably higher than the roof of the house, they have terra cotta tops on, and have only been in use one year. Yet they throw out soot almost continually, which falls like rain over my new paints. Can you suggest a remedy? A. Probably your best plan is to clean your chimney and burn anthracite coal. You do not mention what kind of coal you burn; take it for granted that you burn bituminous. With this coal, perfect combustion is the only remedy for sooty chimneys and atmosphere. Perfect combustion can only be had by applying some smoke consuming device or by feeding the fresh coal beneath the fire so that the smoke will have to traverse the hot coal. This arrangement is provided for in stoves and ranges in the Western market.

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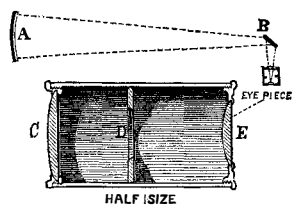
(25) E. C. R. writes: I have a Cleveland study lamp, the principle of which is similar to the German student lamp, and I am troubled with having the flame, after burning a short time, gradually go lower and lower, and then, if I raise and lower the tank or oil receptacle several times in quick succession, which I imagine forces the oil through the apparently partly impeded passage leading from the tank to the wick, the flame will again assume its regular height and perhaps not grow smaller again for the remainder of the evening. Now I suppose that the pipe leading from the tank to the wick is lined with grease or something similar, thus preventing the oil from readily flowing to the wick, and what I wish to know is what can I clean this channel or pipe with (some liquid) that will not eat the metal, and yet destroy the grease sufficiently to clear the pipe? A. If the feed tube of your lamp is obstructed, put a solution of potash and water into the tank holder afterwashing out the lamp with hot water. Let it stand for a day, then clean out with hot water. See that it runs a free stream when the tank holder is full of water. It is possible that the nipple at the bottom of the tank is too low and seals itself. It should not be below the top of the tube that feeds the lamp.

(26) T. M. asks: 1. What size leather belt would you advise to transmit 125 horse power; shafts 50 feet from center to center, small pulley 42 inches diameter? Belt speed 2200 feet per minute. A. Your pulley is too small to transmit 125 horse power. It will require a belt or a number of belts equal to 60 inches in width upon 42 inch pulleys. Better use 4 foot pulleys and 2 belts 24 inches wide running at the speed you give. 2. What size shaft would you recommend for main shaft in mill? A. The size of the shaft depends upon whether you distribute the power upon both sides of the receiving pulleys. A 4½ inch shaft if for one way, a 4 inch shaft if both ways. 3. Give me the best method for making engine foundations. A. A brick foundation with granite cap stones with anchor bolts from the bottom is the best.

(27) H. M. W. writes: I have a large saw mill run by steam. We run the engine by burning sawdust, but we cannot get rid of more than one-eighth of it in this way. Now, is there no way in which the sawdust can be utilized without a great outlay for machinery? A. Sawdust can be used in the manufacture of pyroligneous acid and methylic spirit. It also makes good manure, but is slow in rotting. It should be thickly spread and plowed in; two years will be required for effect.

(28) G. M. S. asks: 1. What can I use to waterproof coat a large canvas used as shed for portable saw mill? Would like to make it fireproof also. A. See SUPPLEMENT, No. 159. 2. Can I run a 1 inch by 40 inch steel shaft and disk 100,000 revolutions per minute? Boxes are very long, hollow, and a cold stream of water is forced through, also a jet of oil under great pressure. A. It is improbable a 1 inch shaft can be given a speed of 100,000 revolutions per minute. 3. Could not water, powder, or dynamite be made red hot without burning, if so powerfully confined that it could not explode? Would it not be impossible to freeze water under the same condition? A. If powder or dynamite is confined in a chamber that is strong enough to prevent bursting, it will not prevent the chemical combination, when brought to the proper condition for explosion, whether by heat or otherwise. The pressure will last until reduced by cooling, new combinations, or waste. These experiments have been made by firing a confined charge and allowing it to waste through a small vent. Water will freeze if confined, and put the vessel holding it under immense pressure. We think that great pressure will not prevent it from freezing. 4. Could not steam be heated to such a degree that it would not return to a fluid state? A. Yes. Could be heated under pressure, until its chemical constituents are dissociated. 5. If it was possible to so powerfully compress wood or other substance as to make it as dense as iron, would it not be as heavy, as hard, and as strong as iron? Has extreme pressure of such substances ever been experimented upon? A. Wood compressed would become no heavier than its chemical constituents considered as solid bodies. Wood has been put under great pressures, but we do not know of any profitable results.

(29) A. R. H. writes: I am attempting to make a Newtonian telescope, described in SUPPLEMENT, No. 179, but there are some points I don't understand, and I have concluded to write and ask a few questions, hoping that you could enlighten me. Is the mirror glass or metal, and what is its size? The writer does not give the number or kind of lenses used in the eyepiece. How are the rays thrown through the eyepiece? What is meant by the flat which is mounted on the sliding piece? Is it necessary to have copper bars or any bars at all, and why is the mirror supporting base composed of layers of wood glued together? Are the reflected rays of the mirror thrown up through the center of the tube, and how are the lenses arranged? A.



HALF SIZE

For your Newtonian telescope a mirror of speculum metal is to be preferred, although fine glass specula are now made with a silvered surface. The size of the mirror should be about one-twelfth the focal length of the telescope that you wish to make. The flat is the small oval plane mirror used near the focal end to reflect the image forming rays through the side of the tube or frame, so that in viewing an object your head will not interrupt the incident light. The details of the construction need not be followed strictly, as the mirror support may be made of a solid piece. The above sketch may answer some of the other questions. A, speculum; B, flat; C, field lens; D, diaphragm; E, eye lens. The eye piece is Huyghenian.

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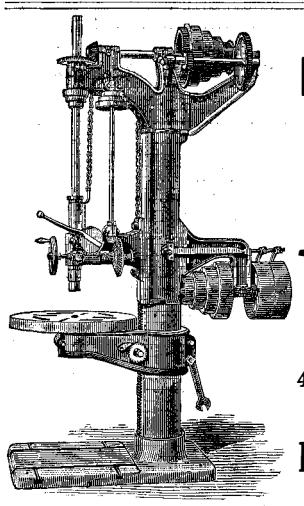

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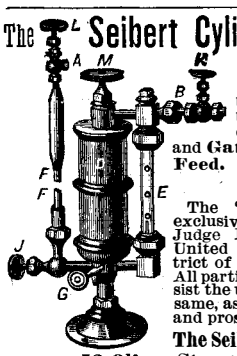

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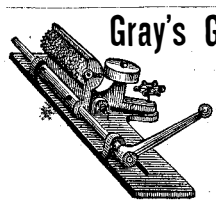

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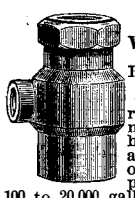

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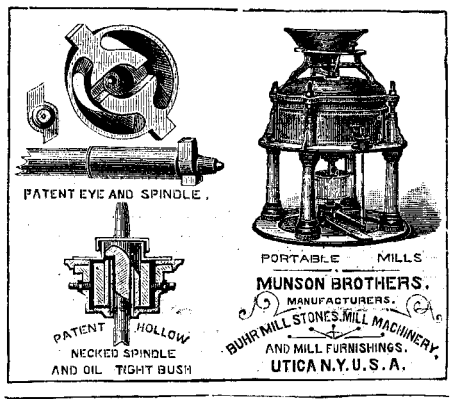
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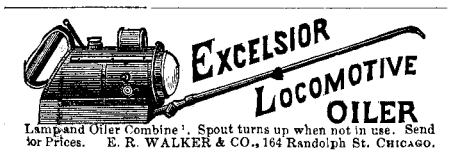

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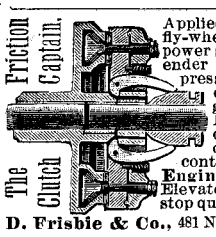

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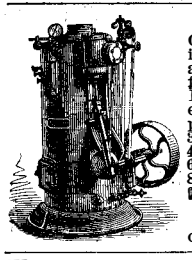

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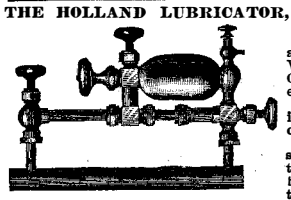

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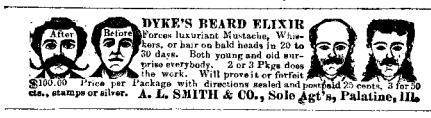

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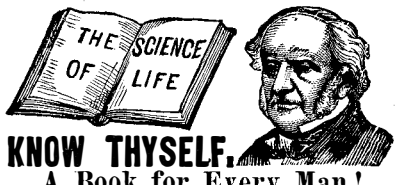

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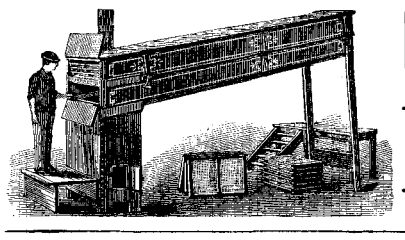

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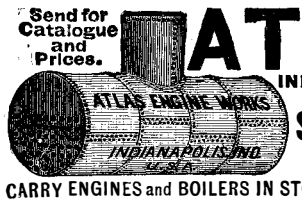

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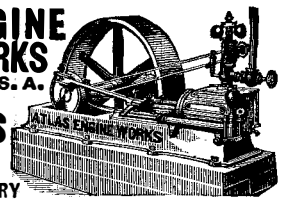

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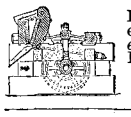

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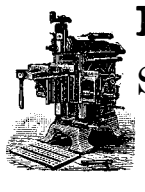

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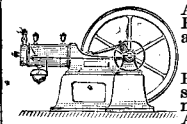

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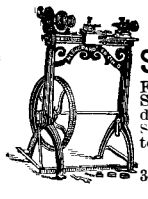

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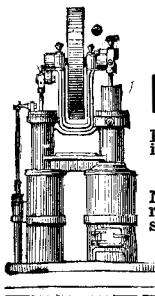

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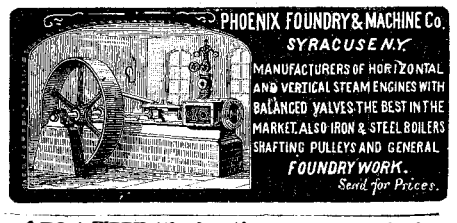
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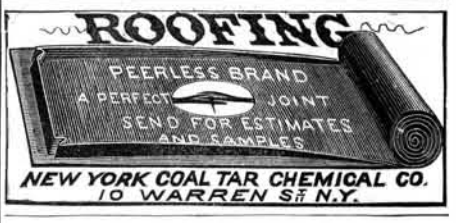

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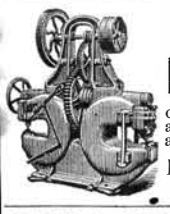

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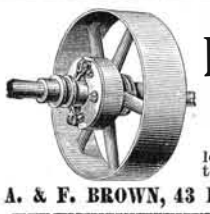

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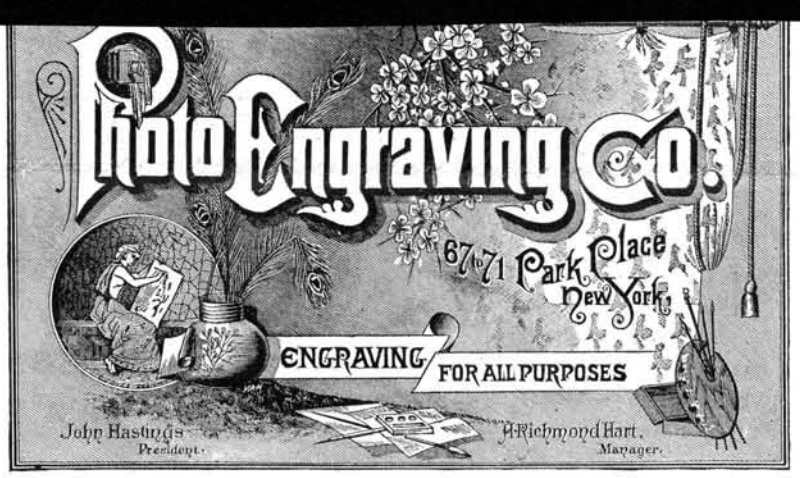

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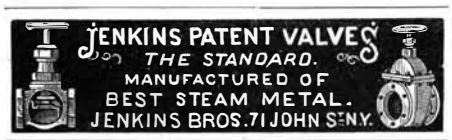

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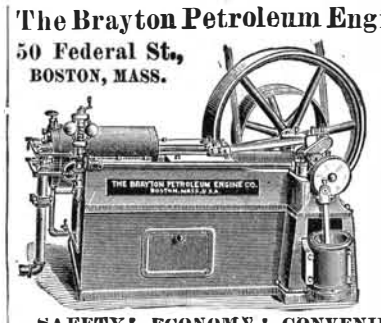

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